United States
Department of
Agriculture

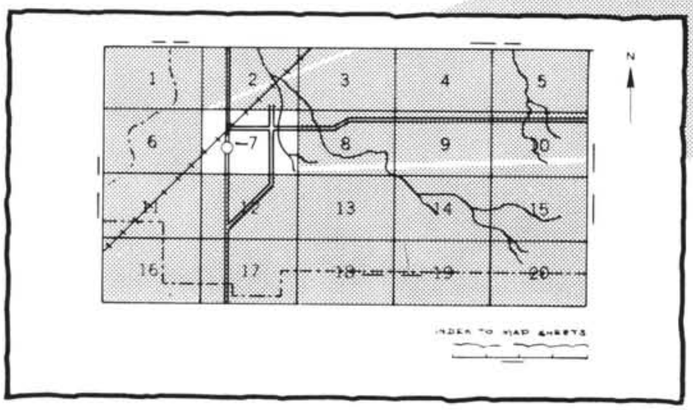
Soil
Conservation
Service

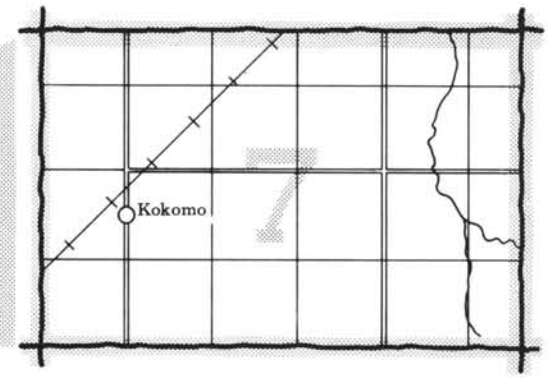
In cooperation with
Purdue University
Agricultural Experiment
Station and Indiana
Department of Natural
Resources, Soil and Water
Conservation Committee

Soil Survey of Randolph County, Indiana

HOW TO USE

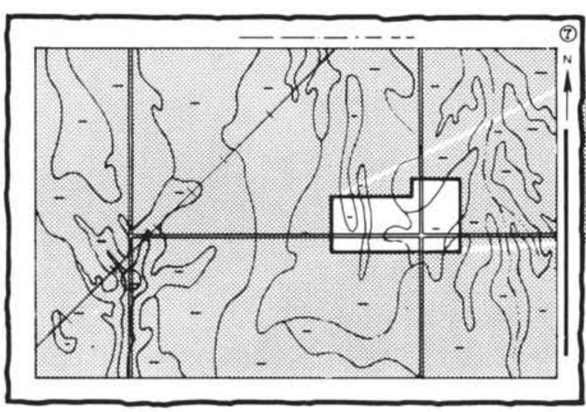
1. Locate your area of interest on the "Index to Map Sheets"

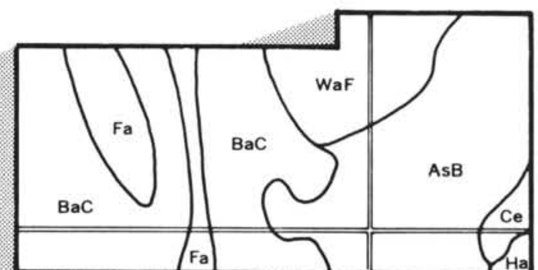




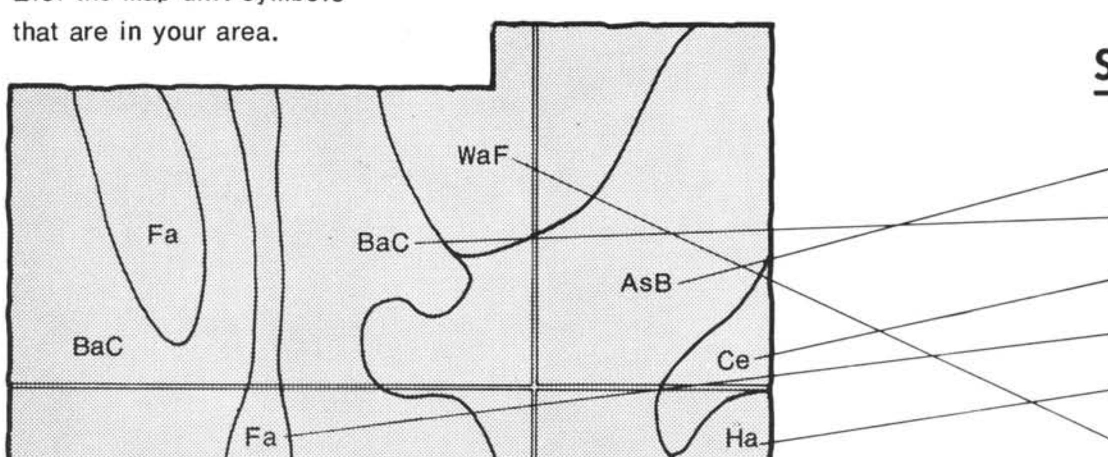
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





4. List the map unit symbols that are in your area.



Symbols

AsB
BaC
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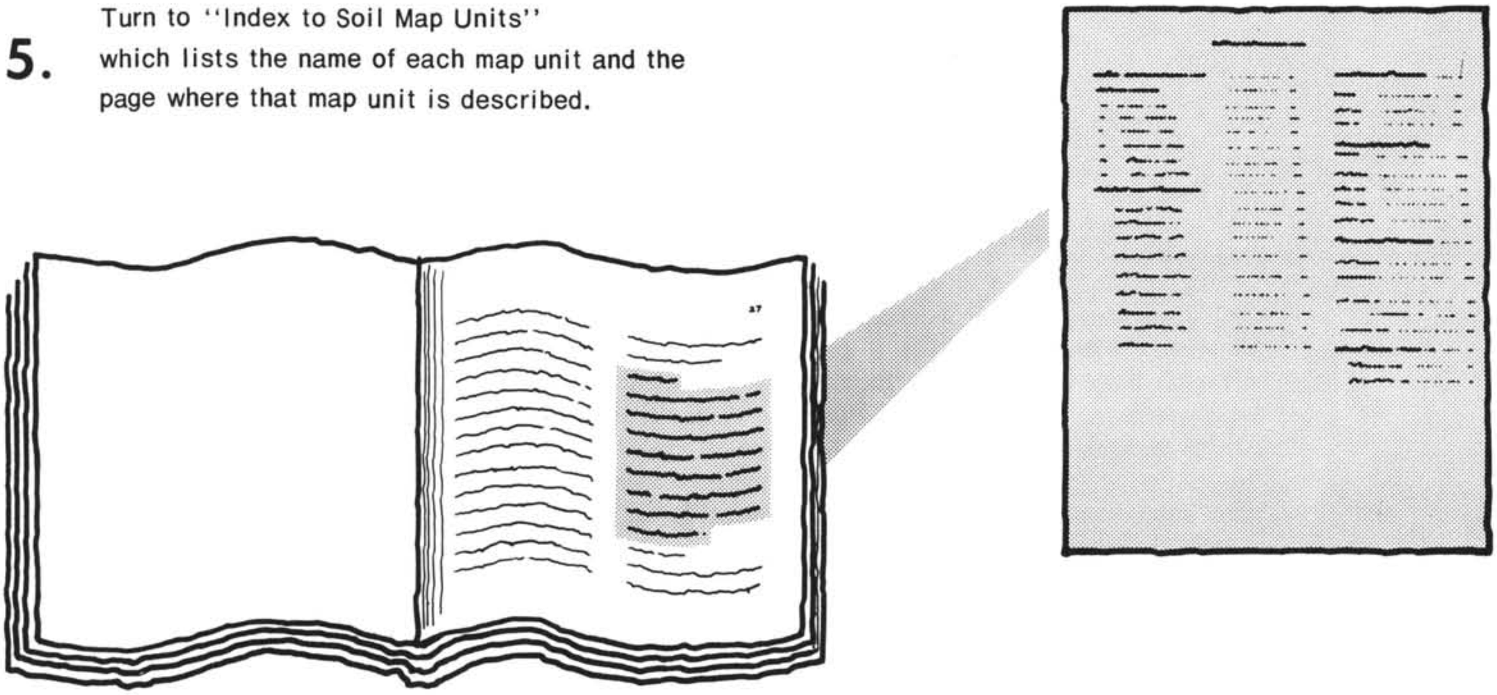
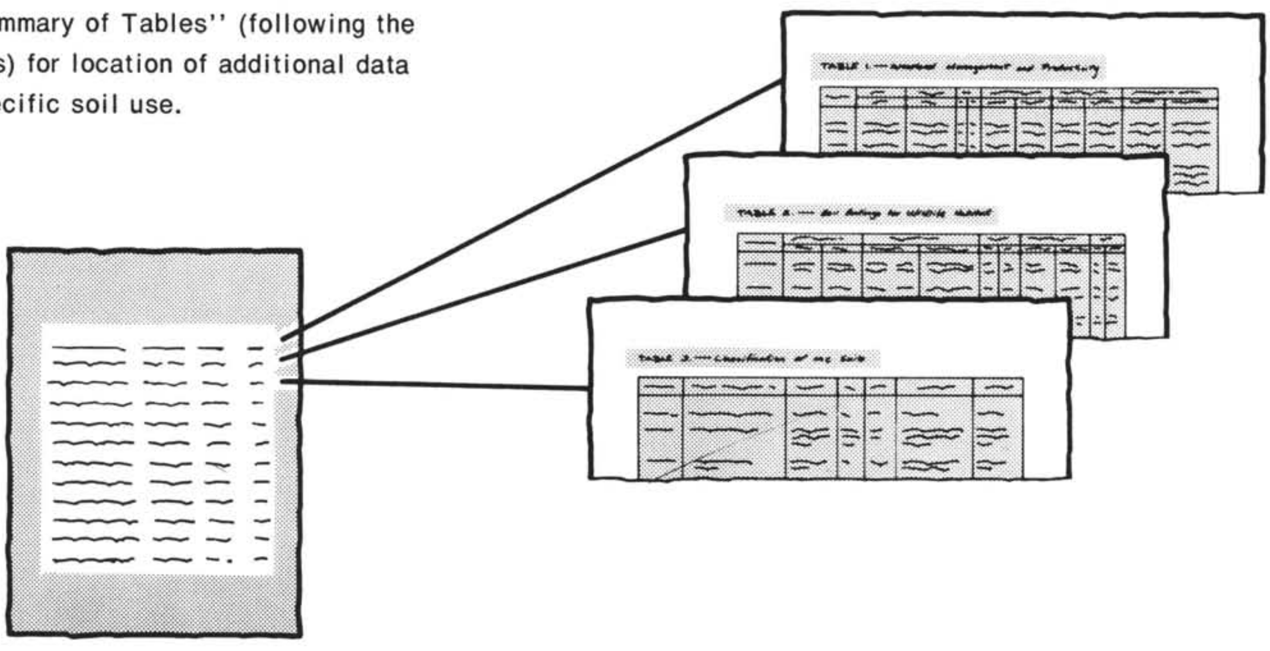
THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, handicap, or age.

Major fieldwork for this soil survey was completed in 1981. Soil names and descriptions were approved in 1984. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1981. This survey was made cooperatively by the Soil Conservation Service, the Purdue University Agricultural Experiment Station, and the Indiana Department of Natural Resources, Soil and Water Conservation Committee. It is part of the technical assistance furnished to the Randolph County Soil and Water Conservation District. Financial assistance was made available by the Randolph County Commissioners.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Harvesting soybeans in an area of Fincastle-Crosby silt loams, 0 to 1 percent slopes.

Contents

Soil Series

Issued December 1987

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Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Randolph County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Robert L. Eddleman

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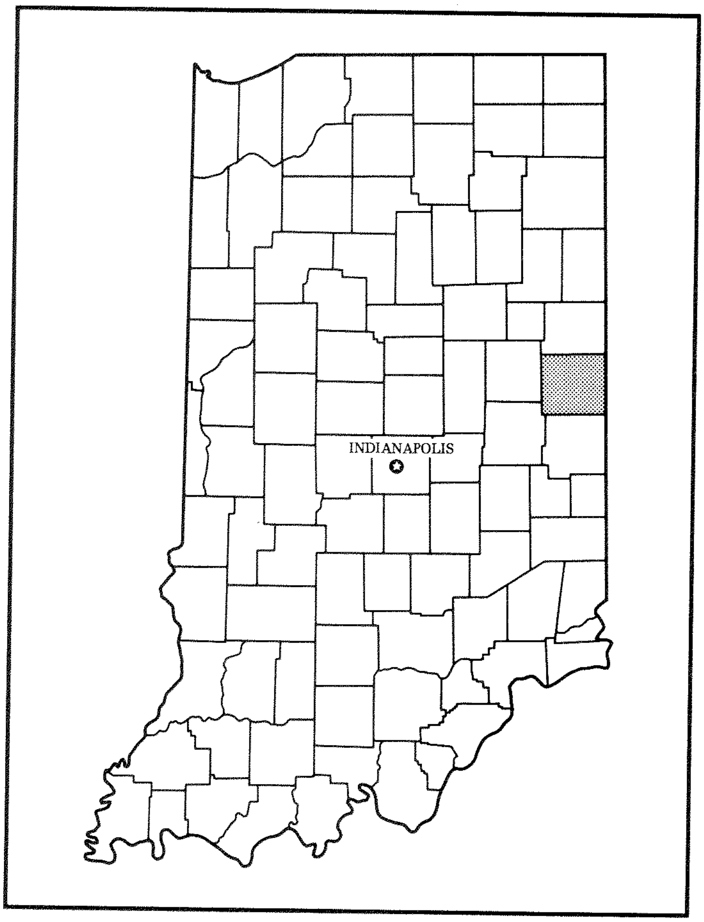
State Conservationist
Soil Conservation Service



Location of Randolph County in Indiana.

Soil Survey of Randolph County, Indiana

By Travis Neely, Soil Conservation Service

Fieldwork by Travis Neely, Soil Conservation Service, and
Noel P. Anderson, Bruce J. Houghtby, Gary R. Gundrum, Carol J. Latowski,
Ronald E. Pearson, and Terrence M. Sobecki, Indiana Department of
Natural Resources, Soil and Water Conservation Committee

United States Department of Agriculture, Soil Conservation Service,
in cooperation with
Purdue University Agricultural Experiment Station and Indiana Department
of Natural Resources, Soil and Water Conservation Committee

RANDOLPH COUNTY is in the east-central part of Indiana. It has a total area of 290,253 acres, or 453.5 square miles. It is bordered on the east by Ohio, on the west by Henry and Delaware Counties, on the south by Wayne County, and on the north by Jay County.

Winchester, the county seat, is about 80 miles northeast of Indianapolis. Other towns in the county include Parker City, Modoc, Union City, Lynn, Farmland, Deerfield, Ridgeville, Saratoga, Losantville, and Huntsville. Businesses within the county provide employment for most of the local work force. About three-fourths of the work force is engaged in manufacturing.

About 81 percent of the acreage in the county is highly productive farmland. Corn, soybeans, wheat, and tomatoes are the principal crops.

This survey updates the soil survey of Randolph County published in 1931 (*3*). It provides additional information and larger maps, which show the soils in greater detail.

General Nature of the County

This section gives general information about Randolph County. It describes physiography and relief, the water supply, transportation facilities, trends in population and land use, and climate.

Physiography and Relief

The highest point in Randolph County is 1,257 feet above sea level. It is in an area of Greensfork Township about 3 miles northeast of Lynn. The lowest point is 930 feet above sea level. It is an area of Green Township near the Mississinewa River.

The county has seven physiographic subdivisions—bottom land, lake plains, the Knightstown end moraine, the Mississinewa end moraine, outwash plains, the Union City end moraine, and till plains. The bottom land is characterized by nearly level soils along the rivers and creeks. The lake plains are throughout most of the county. Many irregularly shaped areas of muck are in deep depressions and potholes.

The Knightstown end moraine is characterized by gently sloping ridgetops and moderately sloping to steep side slopes. It is dissected by numerous streams and drainageways. In general, the steeper side slopes and narrower ridgetops are near the main streams. Large boulders are on the surface and in the subsoil.

The Mississinewa and Union City end moraines extend throughout much of the northern and central parts of the county. They are characterized by many abrupt changes in slope, surface texture, and land use. Slopes range from nearly level to steeply sloping within short distances. Many irregularly shaped areas of muck are in deep depressions and potholes. The side slopes are commonly eroded. The sloping soils are well drained. In some small areas on sides slopes and in some small drainageways, however, tile drainage is needed. Many natural drainageways are in the depressions and potholes.

The outwash plains are extensive along the Mississinewa and White Rivers and other streams. Small, isolated areas of terraces are along the stream valleys. The outwash plain along the Mississinewa River is the largest of the plains. It is 0.5 mile to 1.5 miles wide in most areas. Natural drainageways are on the outwash plains. Most of the soils are well drained, but a few areas of somewhat poorly drained to very poorly drained soils are on the plains.

The till plains are nearly level in most areas. Areas along the major stream valleys, however, are gently sloping to moderately steep. Most of the till plains are 980 to 1,200 feet above sea level. Most of the creeks and rivers are 50 to 260 feet lower than the plains. Several of the plains are at different elevations and are separated by short slopes.

Water Supply

The water for farms, homes, and industries in Randolph County generally is drawn from wells. A few springs provide plenty of good-quality water for livestock and domestic uses. Water for livestock is available from streams on many farms. It is near the surface on nearly all the bottom land. Pumps are commonly used on most of the gravelly and sandy terraces. Water for farm uses is generally within 40 feet of the surface, but adequate supplies for livestock, irrigation, and industry generally are at a greater depth. The underlying bedrock is primarily limestone. Though the water occurs at varying depths, an adequate supply of ground water generally is available for domestic, livestock, public, and industrial uses.

Transportation Facilities

Randolph County has good transportation facilities. The major north-south roads are U.S. Highway 27 and Indiana Highways 1 and 227. The major east-west roads are Indiana Highways 32 and 28 and U.S. Highway 36. U.S. Highway 35 passes through the southwest corner of the county. All public roads in the county are either paved or surfaced with gravel.

Three railroads pass through or near all the major towns in the county. They provide facilities for shipment of agricultural and industrial supplies.

Trends in Population and Land Use

Randolph County has a population of about 30,000 and a population density of 70 people per square mile. The population increased only 20.7 percent between 1930 and 1978 but is expected to be more than 40,000 by the year 2000. Winchester, the largest town, has about 6,000 inhabitants.

Because of the land-clearing measures applied in the county, urban development has little effect on the acreage used for agricultural purposes. Cropland is being rapidly developed for urban uses only in a narrow band around Union City and Winchester. During the period 1967 to 1978, the average of land under urban development increased by 5 percent and 81 percent of the county continued to be used for agricultural purposes (*6*). By the year 2010, about 85 percent of the total acreage in the county is expected to be agricultural land.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Winchester, Indiana, in the period 1951 to 1978. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 27 degrees F, and the average daily minimum temperature is 19 degrees. The lowest temperature on record, which occurred at Winchester on January 16, 1972, is -20 degrees. In summer the average temperature is 71 degrees, and the average daily maximum temperature is 82 degrees. The highest recorded temperature, which occurred at Winchester on September 3, 1953, is 102 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 37 inches. Of this, 21 inches, or 57 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 17 inches. The heaviest 1-day rainfall during the period of record was 4.25 inches at Winchester on August 10, 1969. Thunderstorms occur on about 45 days each year.

The average seasonal snowfall is nearly 22 inches. The greatest snow depth at any one time during the period of record was 14 inches. On the average, 14 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the south-southwest.

Average windspeed is highest, 12 miles per hour, in spring.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The names, descriptions, and delineations of the soils identified on the general soil map of this county do not always agree or join fully with those of the soils identified on the maps of adjoining counties published at an earlier date. Some differences are the result of changes in concepts of soil series. Other differences result from variations in the extent of the soils. Others are the result of variations in the slope range allowed in the associations.

Soil Descriptions

1. Glynwood-Pewamo-Morley Association

Nearly level to moderately sloping, deep, moderately well drained, very poorly drained, and well drained, medium textured and moderately fine textured soils formed in glacial till; on uplands

These soils are on slightly dissected uplands that are characterized by numerous small streams and rivers. Areas are large and are throughout the northern part of the county.

This association makes up about 24 percent of the county. It is about 50 percent Glynwood soils, 28 percent Pewamo soils, and 14 percent Morley soils, and 8 percent minor soils (fig. 1).

The Glynwood soils are gently sloping and moderately well drained. They are on knolls and short, uneven side slopes along drainageways. Typically, the surface layer is grayish brown silt loam about 8 inches thick. The subsoil is dark brown, mottled, firm clay about 18 inches thick.

The Pewamo soils are nearly level and very poorly drained. They are on broad flats, in depressional areas, and in small drainageways. Typically, the surface layer is very dark gray silty clay loam about 9 inches thick. The subsurface layer is very dark gray silty clay about 9 inches thick. The subsoil is about 32 inches thick. The upper part is dark gray and gray, mottled, firm silty clay, and the lower part is gray, mottled, firm silty clay loam.

The Morley soils are gently sloping and moderately sloping and are well drained. They are on narrow ridgetops, on breaks along the major streams, and on side slopes adjacent to some small drainageways. Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 24 inches thick. The upper part is yellowish brown, firm silty clay loam; the next part is yellowish brown and dark yellowish brown, firm silty clay and clay; and the lower part is brown, firm silty clay loam.

Minor in this association are the Eldean Variant and Blount soils. The well drained Eldean Variant soils are on stream terraces adjacent to bottom land. The somewhat poorly drained Blount soils are on broad flats and slight rises in the uplands.

This association is used mainly for cultivated crops or for pasture or hay. Some areas are used as woodland. Most wooded areas are swampy and undrained or are moderately sloping. The more sloping areas are fairly well suited to cultivated crops and well suited to forage crops. Erosion is the main hazard in these areas. If drained, the nearly level Pewamo soils are well suited to cultivated crops. Ponding is a hazard on these soils.

Because of the ponding, the Pewamo soils are generally unsuitable as sites for buildings and sanitary facilities. The gently sloping or moderately sloping Glynwood and Morley soils are moderately limited as sites for buildings. They are severely limited as sites for sanitary facilities because of moderately slow or slow permeability.

The Glynwood and Morley soils are suited to intensive recreation uses. Restricted permeability, wetness, and slope are the main limitations. Land leveling is needed in some areas. The Pewamo soils are poorly suited to intensive recreation uses because of the ponding.

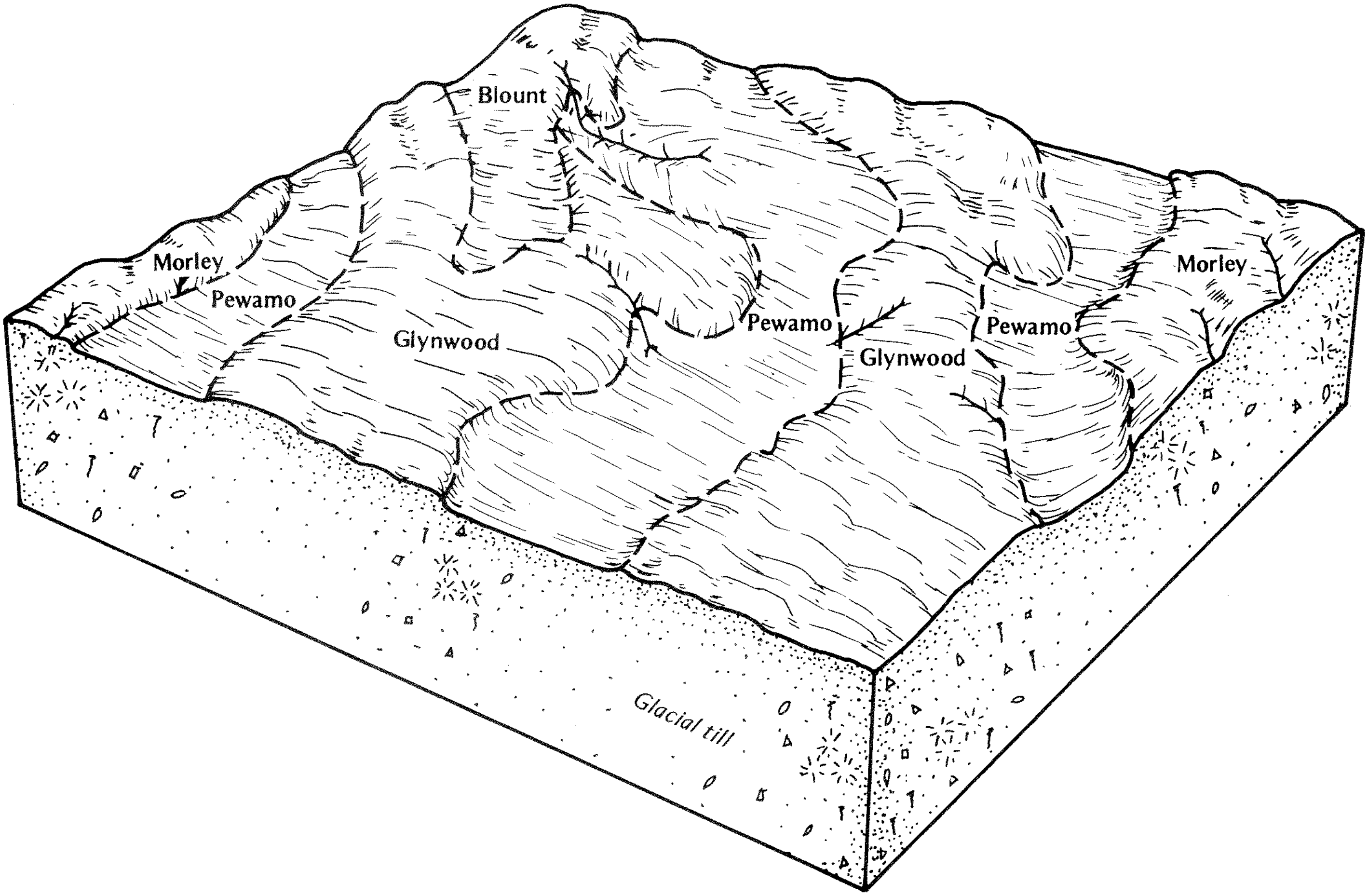


Figure 1.—Pattern of soils and parent material in the Glynwood-Pewamo-Morley association.

2. Celina-Patton-Losantville Association

Nearly level to moderately steep, deep, moderately well drained, poorly drained, and well drained, medium textured and moderately fine textured soils formed in loess and in the underlying glacial till, in glacial till, and in lacustrine sediments; on uplands and lake plains

This association is on highly dissected uplands and lake plains paralleling the major streams. It makes up about 22 percent of the county. It is about 28 percent Celina soils, 28 percent Patton soils, 21 percent Losantville soils, and 23 percent minor soils (fig. 2).

The Celina soils are gently sloping and moderately well drained. They are in low lying swales. Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsurface layer is brown, mottled silt loam about 9 inches thick. The subsoil is about 15 inches of brown and yellowish brown, mottled, firm silty clay and clay.

The Patton soils are nearly level and poorly drained. They are in broad depressions and small drainageways. Typically, the surface layer is very dark grayish brown silty clay loam about 7 inches thick. The subsurface layer also is very dark grayish brown silty clay loam. It is about 4 inches thick. The subsoil is gray, mottled, firm silty clay loam about 21 inches thick.

The Losantville soils are gently sloping to moderately steep and are well drained. They are on side slopes and ridgetops. Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil is about 12 inches thick. It is firm. The upper part is dark brown silty clay loam, and the lower part is yellowish brown clay loam.

Minor in this association are the Fox, Miami, Fincastle, Crosby, Pewamo, Treaty, Westland, Linwood, and Wallkill soils. The well drained Fox soils are on terraces adjacent to bottom land. The well drained Miami soils are on slight rises in upland areas adjacent to terraces. The nearly level, somewhat poorly drained Fincastle and

Crosby soils are on broad flats and slight rises in the uplands. The very poorly drained, nearly level Pewamo, Treaty, and Westland soils are in broad depressions and small drainageways. The very poorly drained Linwood and Wallkill soils are in potholes and deep depressions in the uplands.

Nearly all areas of this association are used for cultivated crops. A few undrained areas are wooded or are used for pasture. Growing cash-grain crops and raising hogs, beef, dairy cattle, and chickens are the main farm enterprises.

If drained, the Patton soils are well suited to cultivated crops. They are severely limited as sites for urban development because of ponding. The Celina and Losantville soils are moderately limited or severely limited as sites for buildings and most sanitary facilities. The Celina soils are suited to cultivated crops, and the Losantville soils are well suited to generally unsuited. Wetness and slope are the main limitations affecting urban and farm uses in this association. Erosion is a hazard.

3. Eel-Sloan-Fox Association

Nearly level to moderately sloping, moderately well drained, very poorly drained, and well drained, medium textured soils that are deep or are moderately deep over sand and gravel; formed in alluvium and outwash on flood plains and stream terraces

Most areas of this association are nearly level. Areas dissected by overflow channels and drainageways, however, are steeper.

This association makes up about 7 percent of the county. It is about 30 percent Eel soils, 22 percent Sloan soils, 11 percent Fox soils, and 37 percent minor soils (fig. 3).

The Eel soils are nearly level and moderately well drained. They are on slight rises on the flood plains.

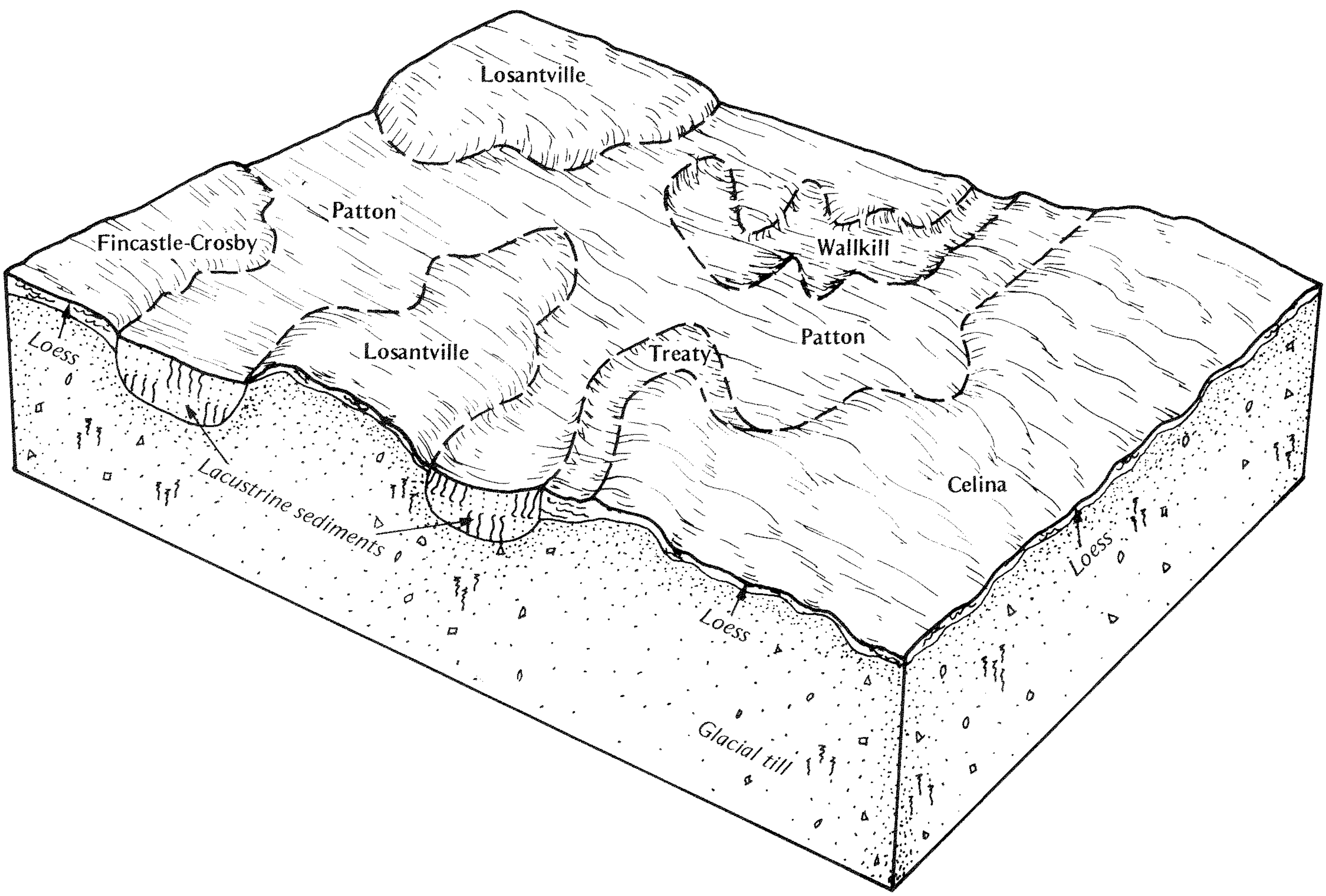


Figure 2.—Pattern of soils and parent material in the Celina-Patton-Losantville association.

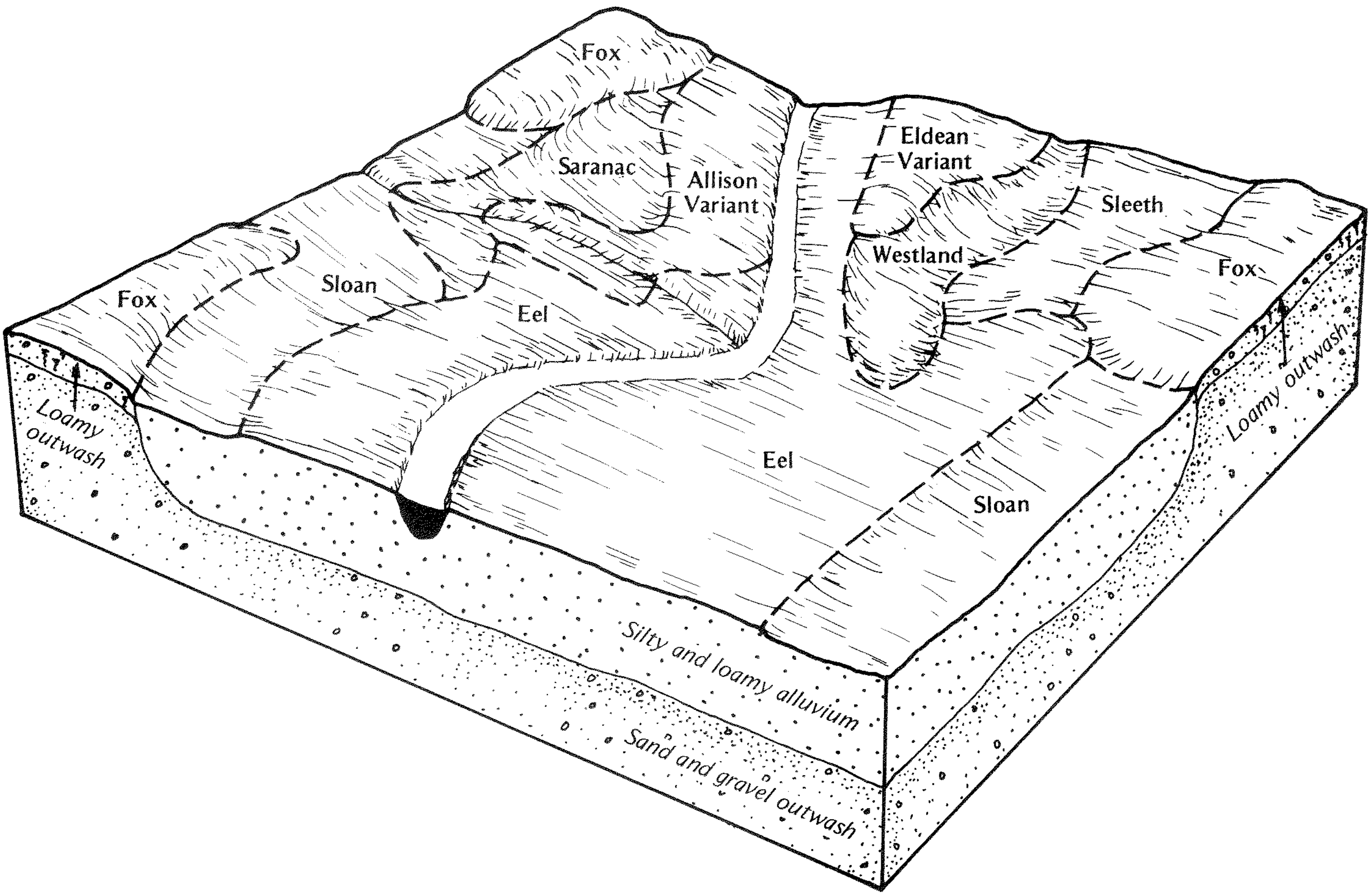


Figure 3.—Pattern of soils and parent material in the Eel-Sloan-Fox association.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsurface layer also is dark grayish brown silt loam. It is about 4 inches thick. The underlying material to a depth of about 60 inches is multicolored, mottled, friable loam.

The Sloan soils are nearly level and very poorly drained. They are in slight depressions and drainageways on bottom land. Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is very dark grayish brown silty clay loam about 8 inches thick. The subsoil is about 24 inches thick. It is friable. The upper part is grayish brown, mottled clay loam; the next part is dark gray, mottled loam; and the lower part is grayish brown clay loam.

The Fox soils are nearly level to moderately sloping and are well drained. They are on slight rises and on breaks and side slopes along stream terraces and small drainageways. Typically, the surface layer is dark brown loam about 8 inches thick. The subsurface layer also is dark brown loam. It is about 3 inches thick. The subsoil is about 24 inches thick. It is firm. The upper part is reddish brown and dark reddish brown clay loam, and the lower part is dark reddish brown sandy clay loam.

Minor in this association are the well drained Allison Variant and Eldean Variant soils, the somewhat poorly drained Sleeth soils, the poorly drained Saranac soils, and the very poorly drained Sloan and Westland soils. Allison Variant soils are on slight rises on broad flood plains. Eldean Variant soils are on outwash plains. Sleeth soils are on broad flats and slight rises on terraces. Saranac and Sloan soils are on the lowest parts of the flood plains. The nearly level Westland soils are in broad depressions and in swales and drainageways.

Most of this association is used for cultivated crops or woodland. A few areas are used for pasture. The main farm enterprise is growing cash-grain crops. Some gravel pits and limestone quarries are in areas of this association. A few areas are used for urban development.

If protected from flooding and if drained, the Eel and Sloan soils are well suited to cultivated crops during most years. They are severely limited as sites for urban uses because of the flooding and the wetness. The Fox soils are well suited or fairly well suited to cultivated crops. They are droughty. They are well suited to most urban uses, but a poor filtering capacity is a problem in septic tank absorption fields.

4. Losantville, Stony Subsoil-Patton-Crosby, Stony Subsoil Association

Nearly level to strongly sloping, deep, well drained, poorly drained, and somewhat poorly drained, medium textured and moderately fine textured soils formed in glacial till and lacustrine sediments; on uplands and lake plains

This association is on highly dissected uplands and lake plains. It makes up about 16 percent of the county. It is about 33 percent Losantville soils, 26 percent Patton soils, 21 percent Crosby soils, and 20 percent minor soils.

The Losantville soils are gently sloping to strongly sloping and are well drained. They are on ridgetops and on side slopes along small drainageways. Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil is firm clay loam about 12 inches thick. The upper part is yellowish brown, and the lower part is dark yellowish brown. These soils have cobbles and stones.

The Patton soils are nearly level and poorly drained. They are on broad flats and in depressions. Typically, the surface soil is very dark grayish brown silty clay loam about 11 inches thick. The subsoil is gray, mottled, firm silty clay loam about 21 inches thick. These soils have very few stones.

The Crosby soils are nearly level and gently sloping and are somewhat poorly drained. They are on broad flats and slight rises in the uplands. Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsurface layer is grayish brown silt loam about 3 inches thick. The subsoil is brown and yellowish brown, mottled, firm clay loam about 13 inches thick. These soils have cobbles and stones.

Minor in this association are the well drained Fox and Miami soils, the moderately well drained Celina soils that have a stony subsoil, the moderately well drained Eel soils, the very poorly drained Sloan soils, and the very poorly drained Treaty soils that have a stony subsoil. Fox soils are on slight rises and side slopes on small stream terraces. Miami soils are on uplands. They are underlain by sand and gravelly sand. Celina soils are in dome-shaped areas. Eel and Sloan soils are in small areas on flood plains. Treaty soils are in slight depressions on uplands.

Most areas of this association are used for cultivated crops. The steeper areas and the flood plains are generally used for permanent pasture or wildlife habitat. Many of the strongly sloping areas are used as woodland. The main farm enterprises are growing cash-grain crops and raising dairy cattle, beef cattle, and hogs. The nearly level and gently sloping soils are well suited to cultivated crops. Erosion is the main hazard.

The Losantville and Crosby soils are moderately limited as sites for dwellings and are poorly suited to sanitary facilities. The Patton soils are severely limited as sites for dwellings and sanitary facilities because of ponding.

5. Blount-Pewamo Association

Nearly level, deep, somewhat poorly drained and very poorly drained, medium textured and moderately fine textured soils formed in glacial till; on uplands

These soils are on uplands characterized by swales and swells. They are along drainageways and on slight rises.

This association makes up about 15 percent of the county. It is about 40 percent Blount soils, 36 percent Pewamo soils, and 24 percent minor soils.

The Blount soils are somewhat poorly drained. They are on broad flats and slight rises. Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsurface layer is grayish brown, mottled silt loam about 3 inches thick. The subsoil is about 19 inches thick. It is mottled and firm. The upper part is brown silty clay loam, the next part is grayish brown silty clay, and the lower part is grayish brown silty clay loam.

The Pewamo soils are very poorly drained. They are on broad flats and in depressions and small drainageways. Typically, the surface soil is very dark gray silty clay loam about 18 inches thick. The subsoil is about 32 inches thick. It is mottled and firm. The upper part is dark gray and gray silty clay, and the lower part is gray silty clay loam.

Minor in this association are the well drained Morley soils, the moderately well drained Glynwood soils, and the very poorly drained Wallkill, Carlisle, and Linwood soils. Morley and Glynwood soils are on side slopes and narrow breaks along small drainageways. Wallkill, Carlisle, and Linwood soils are in low lying pockets and potholes.

This association is used mainly for cultivated crops, small grain, or forage crops. If drained, it is well suited to these crops. Most of the acreage has been drained. A few undrained areas are used as woodland or pasture. The association is fairly well suited to woodland. Wetness and ponding are the main problems affecting farming and most other uses.

The Blount soils are severely limited as sites for urban uses because of wetness. The Pewamo soils are generally unsuited to these uses because of ponding.

6. Fincastle-Treaty-Crosby Association

Nearly level, deep, somewhat poorly drained and very poorly drained, medium textured soils formed in loess and in the underlying glacial till; on uplands

This association is on uplands characterized by swales and swells. It makes up about 16 percent of the county. It is about 28 percent Fincastle soils, 22 percent Treaty soils, 18 percent Crosby soils, and 32 percent minor soils (fig. 4).

The Fincastle soils are somewhat poorly drained. They are on slight rises. Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsurface layer is grayish brown silt loam about 3 inches thick. The subsoil is about 33 inches thick. It is mottled and firm. The upper part is yellowish brown silty clay loam, and the lower part is grayish brown silt loam.

The Treaty soils are very poorly drained. They are in depressions and small drainageways. Typically, the surface layer is black silt loam about 7 inches thick. The subsurface layer is black silty clay loam about 4 inches thick. The subsoil is about 34 inches thick. It is mottled and firm. The upper part is dark gray silty clay loam, the next part is gray silty clay loam, and the lower part is grayish brown silt loam.

The Crosby soils are somewhat poorly drained. They are on slight rises. Typically, the surface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is about 11 inches thick. It is mottled and firm. The upper part is yellowish brown clay loam, the next part is dark yellowish brown clay, and the lower part is yellowish brown clay loam.

Minor in this association are the well drained Losantville and Miami soils, the moderately well drained Celina soils, the somewhat poorly drained Sleeth soils, the poorly drained Patton soils, and the very poorly drained Wallkill, Carlisle, and Linwood soils. Losantville and Miami soils are on knobs, knolls, and narrow breaks along small drainageways. The gently sloping Celina soils are on the tops of ridges in the uplands. Sleeth soils are on slight rises and are commonly near small streams. Patton soils are on broad flats and in slight

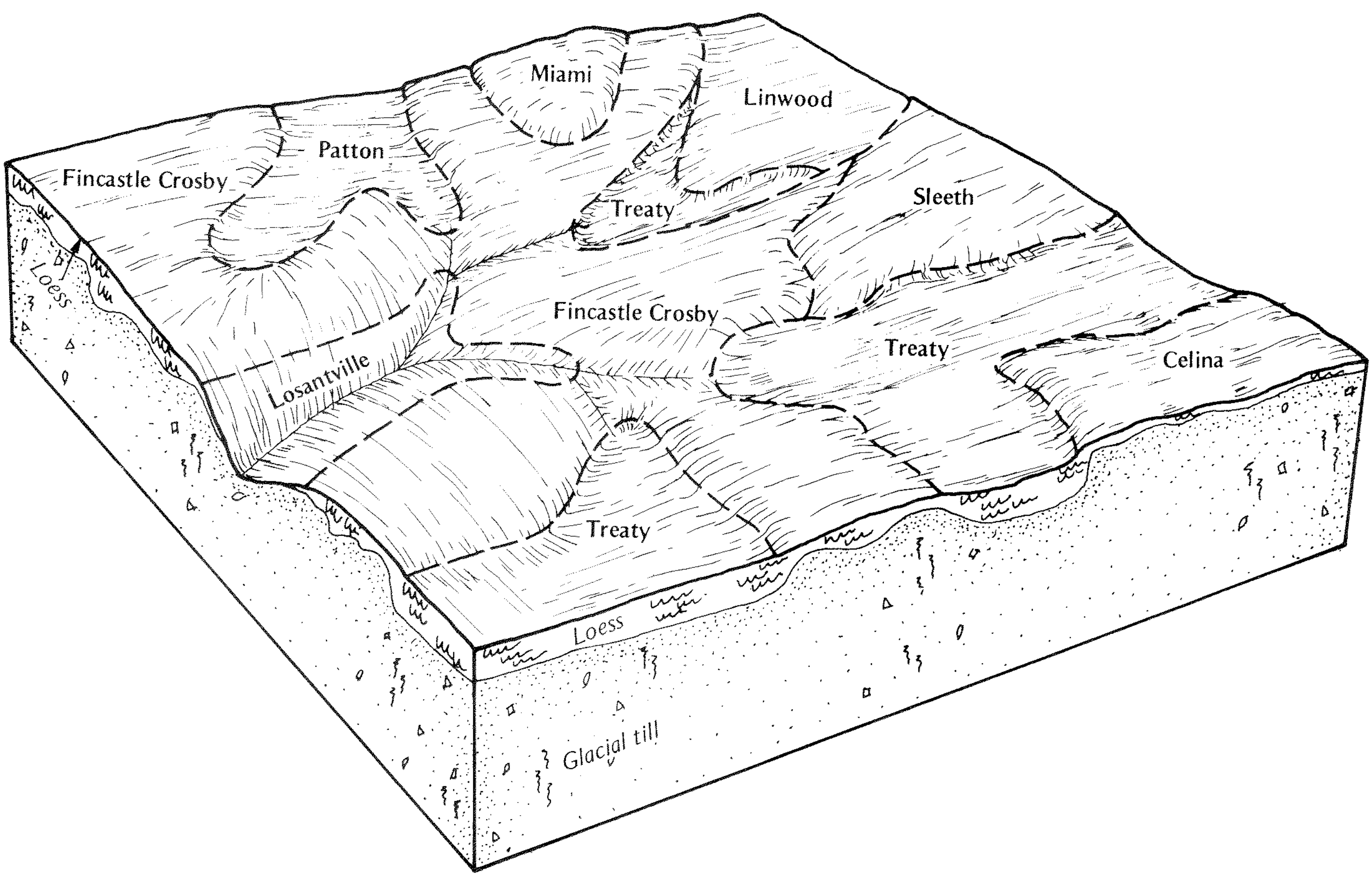


Figure 4.—Pattern of soils and parent material in the Fincastle-Treaty-Crosby association.

depressions. Wallkill, Carlisle, and Linwood soils are in deep depressions and potholes in the uplands.

This association is used for cultivated crops, small grain, or forage crops. If drained, it is well suited to these crops. It is fairly well suited to woodland. The Fincastle and Crosby soils are poorly suited to urban uses because of wetness. The Treaty soils are generally unsuited to these uses because of ponding.

Broad Land Use Considerations

The general soil map is helpful in planning the development of broad areas for various uses, including cultivated crops and pasture, woodland, recreational development, and urban development. The map cannot be used, however, in selecting sites for specific urban structures.

Nearly all of the associations in the county are well suited to farming, but the Eel-Sloan-Fox association is only fairly well suited. A drainage system is needed on most of the soils. Most of the farmland is drained and is otherwise well managed.

The Fox soils in the Eel-Sloan-Fox association are suited to vegetables and other specialty crops. If drained, organic soils also are suited to these crops. The well drained soils are well suited to nursery crops and orchards.

Most of the soils in the county are fairly well suited or well suited to trees. A few areas are managed as commercial woodland. Commercially valuable trees are most common on the well drained soils. They grow more rapidly on these soils than on wet soils.

The Celina, Fox, Glynwood, Losantville, and Morley soils in the Celina-Patton-Losantville, Eel-Sloan-Fox, Glynwood-Pewamo-Morley, and Losantville, stony subsoil-Patton-Crosby, stony subsoil, associations are suitable as sites for parks and natural study areas. Hardwood forests enhance the beauty of some areas in these associations. Some undrained areas provide habitat for many types of wildlife.

About 3 percent of the county is urban or built-up land. Many of the soils are poorly suited to urban development. The Eel and Sloan soils in the Eel-Sloan-Fox association are severely limited as sites for urban uses because of flooding. The Fox soils in this association are well suited to urban development, but a poor filtering capacity is a problem in septic tank absorption fields. On most of the soils in the other associations in the county, an extensive drainage system is needed. The Celina-Patton-Losantville association has the highest percentage of soils that are suited to urban development.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series.* Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Losantville clay loam, 6 to 12 percent slopes, severely eroded, is a phase in the Losantville series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Fincastle-Crosby silt loams, 0 to 1 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

The names, descriptions, and delineations of the soils identified on the detailed soil maps of this county do not always agree or join fully with those of the soils identified on the maps of adjoining counties published at an earlier date. Some differences are the result of changes in concepts of soil series. Other differences result from variations in the extent of the soils. Others are the result of variations in the slope range allowed in the map units.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

An—Allison Variant silty clay, frequently flooded. This nearly level, deep, well drained soil is on slight rises on flood plains. Areas are irregularly shaped or elongated and are 5 to 100 acres in size. The dominant size is about 25 acres.

Typically, the surface layer is very dark grayish brown silty clay about 4 inches thick. The subsurface layer is dark brown silty clay about 14 inches thick. The subsoil is dark brown, firm silty clay loam about 24 inches thick. The underlying material to a depth of 60 inches is yellowish brown clay loam that has thin strata of sandy loam and silt loam. In places the soil is loam or sandy loam to a depth of about 40 inches. In some areas it is only occasionally flooded. In other areas recent alluvium overlies the original black surface layer.

Included with this soil in mapping are small areas of the moderately well drained Eel soils and the poorly drained Saranac soils. Eel soils are in positions on the landscape similar to those of the Allison Variant soil. Saranac soils are in depressions. Also included, on the lower parts of the landscape, are small areas of undrained soils that stay wet for long periods. Included soils make up about 12 percent of the map unit.

The Allison Variant soil is moderately slowly permeable. Available water capacity is high. Surface runoff is slow. Organic matter content is high in the surface layer. This layer becomes cloddy and hard to work if tilled when too wet.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture, and a few are wooded.

This soil is fairly well suited to corn, soybeans, and small grain. The frequent flooding is a hazard, but it normally occurs before the major crops are planted. It can be controlled in some areas by levees or dams, field ditches, and properly located diversions, all of which intercept runoff from the higher areas. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves or helps to maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes, such as bromegrass and ladino clover, for hay and pasture. Flood control is necessary. Overgrazing or grazing when the soil is too wet causes surface compaction, poor tilth, and reduced plant density and hardiness. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods minimize surface compaction and help to maintain good tilth and plant density.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation or by spraying, cutting, or girdling.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. It is severely limited as a site for local roads because of low strength, frost action, and flooding. Fill material is needed to elevate the roadbed. Culverts improve drainage and help to control flooding. Levees also help to control flooding. The base material should be strengthened or replaced with material that can support vehicular traffic.

The land capability classification is IIIw. The woodland ordination symbol is 8A.

BlA—Blount silt loam, 0 to 1 percent slopes. This nearly level, deep, somewhat poorly drained soil is on broad flats and slight rises on till plains and moraines. Areas are long and irregularly shaped and are 3 to 75 acres in size. The dominant size is about 30 acres.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsurface layer is grayish brown, mottled silt loam about 3 inches thick. The subsoil is about 19 inches thick. The upper part is brown, mottled, firm silty clay loam. The next part is dark grayish brown, mottled, firm silty clay. The lower part is grayish brown, mottled, firm silty clay loam. The underlying material to a depth of 60 inches is brown silty clay loam. In a few small areas, the underlying material has less clay. In a few areas along drainageways, the slope is more than 1 percent. In places the subsoil is mainly clay loam or sandy clay loam.

Included with this soil in mapping are small areas of the moderately well drained Glynwood soils on knolls and short, uneven side slopes and the very poorly drained Pewamo soils in broad depressions and in small drainageways. Also included are a few small areas of severely eroded soils on the slightly higher rises. Included soils make up about 12 percent of the map unit.

The Blount soil is slowly permeable. Available water capacity is moderate. Surface runoff is slow. The water table is at a depth of 1 to 3 feet during late winter and early spring. Organic matter is moderate in the surface layer. This layer is friable and can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. A drainage system has been established in most areas. Additional drainage is needed in some areas. Land smoothing and shallow surface drains help to remove excess surface water. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to maintain the organic matter content and good tilth. Erosion is a problem in the included areas where the slope is 2 to 3 percent.

If drained, this soil is well suited to grasses and legumes, such as bromegrass and ladino clover, for hay and pasture. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted forage plants. Grazing under wet conditions causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods minimize surface compaction and help to maintain good tilth and plant density.

This soil is fairly well suited to trees, but only a few areas are wooded. Seedling mortality, the windthrow hazard, and plant competition are the main management concerns. Special site preparation, such as bedding, is needed in some areas. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling. Harvest methods that do not isolate the remaining trees or leave them too widely spaced reduce the windthrow hazard.

Because of the wetness, this soil is severely limited as a site for dwellings. Subsurface drains can lower the water table. The dwellings should be constructed without basements. The soil is severely limited as a site for local roads and streets because of low strength and frost action. The base material should be strengthened or replaced with material that can support vehicular traffic.

Because of the wetness and the slow permeability, this soil is severely limited as a site for septic tank absorption fields. An alternative site should be considered. Perimeter drains can remove excess surface and subsurface water. Filling or mounding with better suited material improves the capacity of the field to absorb the effluent.

The land capability classification is IIw. The woodland ordination symbol is 3C.

Ca—Carlisle muck, undrained. This nearly level, deep, very poorly drained soil is in deep depressions on uplands and stream terraces. The depressions formerly were shallow lakes or marshes. The soil is frequently ponded by runoff from the higher adjacent soils. Areas are irregularly shaped or oval and are 3 to 75 acres in size.

Typically, the surface layer is black muck about 11 inches thick. The subsurface layer also is black muck. It is about 6 inches thick. Below this to a depth of 60 inches is dark brown and dark reddish brown muck. Around the edge of most areas is a narrow strip in which the muck is less than 25 inches thick. In some small areas, less than 25 inches of organic material overlies sandy or loamy material or marl, a thin layer of brown peat is below the surface layer, or partially decomposed logs and tree branches are in the layers of muck. In some areas the content of bog iron is high on the surface or throughout the profile. These areas can be easily identified because they have a dark red or yellowish red surface layer. In places the soil is drained by open ditches and subsurface drains.

Included with this soil in mapping are small areas of soils that have peat, silt, clay, marl, or sand and gravel below a thin layer of muck and areas of soils that have less than 25 inches of organic material. Also included are the poorly drained Patton and very poorly drained Pewamo and Treaty soils in the slightly higher areas and along drainageways. Included soils make up about 9 percent of the map unit.

The Carlisle soil is moderately slowly permeable to moderately rapidly permeable. Available water capacity and organic matter content are very high. Surface water runoff is very slow. Most areas are ponded. The water table is near or above the surface during winter and early spring. In a few areas it is a few inches below the surface for short periods late in summer.

This soil supports cattails, reeds, sedges, marsh grasses, buttonbush, redosier dogwood, willow, and soft maple or other water-tolerant trees or shrubs. It is poorly suited to pasture and generally is unsuited to cultivated crops and hay. It is suited to wetland wildlife habitat. The natural vegetation provides good habitat for wetland wildlife. It furnishes abundant protective cover and a sufficient amount of available food, mainly from seed-bearing shrubs.

This soil is poorly suited to trees. The main management concerns are the equipment limitation, seedling mortality, and the windthrow hazard. Equipment should be used only when the ground is frozen. Special site preparation, such as bedding, is needed in some areas. Harvest methods that do not isolate the remaining trees or leave them too widely spaced reduce the windthrow hazard.

Because of ponding and low strength, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields and is severely limited as a site for local roads. The base material for roads should be replaced with material that can support vehicular traffic. Constructing the roads on raised, well compacted fill material and providing adequate roadside ditches and culverts help to prevent the road damage caused by ponding and frost action. Overcoming these limitations is very difficult.

The land capability classification is Vw. The woodland ordination symbol is 6W.

CeB—Celina silt loam, 1 to 4 percent slopes. This gently sloping, deep, moderately well drained soil is on till plains. Areas are irregular in shape and are 3 to 30 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsurface layer is brown, mottled silt loam about 9 inches thick. The subsoil is about 15 inches of brown and yellowish brown, mottled, firm silty clay and clay. The underlying material to a depth of 60 inches is yellowish brown, calcareous loam. In some areas the surface layer is loam or clay loam. In a few places the subsoil and underlying material have more sand. In a few areas the subsoil is thicker.

Included with this soil in mapping are the very poorly drained Treaty soils in shallow depressions and narrow drainageways and the somewhat poorly drained Crosby soils on slight rises and broad flats. Also included are a few areas of the well drained Losantville soils on knolls and side slopes. These soils dry out late in the spring. Included soils make up about 10 percent of the map unit.

The Celina soil is moderately slowly permeable. Available water capacity is moderate. Surface runoff is medium. The water table is at a depth of 2.0 to 3.5 feet during winter and early spring. Organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some small areas are used for pasture, hay, or woodland.

This soil is well suited to corn, soybeans, and small grain. A cropping system that includes grasses and legumes, diversions, stripcropping, grassed waterways, and grade stabilization structures help to control erosion where cultivated crops are grown. A system of conservation tillage that leaves protective amounts of crop residue on the surface throughout most of the year protects the soil against erosion and improves tilth and the organic matter content. The soil is well suited to no-till farming. In seepy areas in some of the small drainageways and swales, subsurface drains are needed.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa, for hay and pasture. A cover of hay or pasture plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. A few scattered areas are wooded. Plant competition is the main management concern. It can be controlled by cutting, spraying, or girdling.

Because of the shrink-swell potential and the wetness, this soil is limited as a site for dwellings. Foundation drains help to remove excess water. Strengthening foundations and footings and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. The dwellings should be constructed without basements. The soil is severely limited as a site for local roads and streets because of low strength and frost action. The base material should be strengthened or replaced with material that can support vehicular traffic. Roadside ditches help to remove excess water and thus reduce the hazard of frost action.

Because of the wetness and the moderately slow permeability, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field and installing a perimeter drainage system help to overcome these limitations. Filling or mounding with better suited material improves the capacity of the field to absorb the effluent.

The land capability classification is IIe. The woodland ordination symbol is 5A.

CkB—Celina silt loam, stony subsoil, 1 to 4 percent slopes. This gently sloping, deep, moderately well drained soil is on slight rises and knobs on till plains and moraines. Areas are dominantly about 10 acres in size but range from 3 to 35 acres. They generally are irregular in shape, but some are elongated.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is about 18 inches of brown and yellowish brown, mottled, firm silty clay loam and clay loam. It has stones more than 12 inches in diameter. The underlying material to a depth of 60 inches is yellowish brown loam. In severely eroded areas along small drainageways, the slope is more than 4 percent. In some small areas the depth to the underlying material is less than 20 inches. In some areas the surface layer is clay loam or loam. In other areas the subsoil contains more sand. In places the calcareous glacial till is at the surface.

Included with this soil in mapping are small areas of the well drained Losantville, somewhat poorly drained Crosby, and very poorly drained Treaty soils that have a stony subsoil. Losantville soils are on the higher knobs and ridgetops, Crosby soils are in slightly convex areas, and Treaty soils are in depressions. Also included are small areas of soils that stay wet for extended periods and generally are not farmed and small areas of steeper soils adjacent to streams. Included soils make up about 12 percent of the map unit.

The Celina soil is moderately slowly permeable. Available water capacity is moderate. Surface runoff is medium. The water table is at a depth of 2.0 to 3.5 feet during winter and early spring. Organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content. In some areas, however, coarse fragments on or near the surface hinder tillage.

Most areas of this soil are used for cultivated crops. Some small areas are used for pasture, hay, or specialty crops. A few small areas are wooded.

This soil is well suited to corn, soybeans, and small grain. Unless they are removed, the stones can cause problems when the soil is tilled. A cropping system that includes grasses and legumes, diversions, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves or helps to maintain tilth and the organic matter content. In some of the small drainageways and swales, subsurface drains are needed.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa, for hay or pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and poor tilth. Stones on and below the surface can hinder haying. They commonly are removed from the field before hay is seeded. Proper stocking rates, rotation grazing, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. It can be controlled by cutting, spraying, or girdling.

Because of the wetness and the shrink-swell potential, this soil is limited as a site for dwellings. Strengthening foundations and backfilling with coarse textured material help to prevent the damage caused by shrinking and swelling. Properly designing the foundations helps to prevent the structural damage caused by wetness. A drainage system can lower the water table. Water moves slowly to the drainage systems because of the moderately slow permeability. The coarse fragments can cause problems in digging footings for the foundations. Dwellings should be constructed without basements. Retaining as much of the existing vegetation as possible helps to control erosion. Stockpiling the topsoil for use as the final layer prior to reseeding improves the seedbed and thus helps to establish a protective cover of grasses.

Because of frost action and low strength, this soil is severely limited as a site for local roads and streets. Roadside ditches help to remove excess water and thus minimize the damage caused by frost action. The base should be strengthened with material that can support vehicular traffic.

Because of the wetness and the moderately slow permeability, this soil is severely limited as a site for septic tank absorption fields. The coarse fragments can cause problems in installing the trunk lines. Enlarging the absorption field helps to overcome the restricted permeability. The water table can be lowered by an adequate subsurface drainage system. Filling or mounding with better suited material improves the capacity of the field to absorb the effluent. In some areas a sanitary sewer system can be used.

The land capability classification is IIe. The woodland ordination symbol is 5A.

CnB—Crosby silt loam, stony subsoil, 1 to 3 percent slopes. This nearly level and gently sloping, deep, somewhat poorly drained soil is on slight rises on broad till plains and moraines. Areas are irregular in shape and are 3 to 45 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsurface layer is grayish brown silt loam about 3 inches thick. The subsoil is brown and yellowish brown, mottled, firm clay loam about 13 inches thick. It has stones more than 11 inches in diameter. The underlying material to a depth of 60 inches is yellowish brown, calcareous loam. In places the subsoil is thicker. In a few areas it has more sand in the lower part. In some areas it has less clay throughout. In some areas along small drainageways, the slope is more than 3 percent and the soil is eroded. In places the surface layer is loam or sandy loam.

Included with this soil in mapping are small areas of the moderately well drained Celina and very poorly drained Treaty soils that have a stony subsoil. Celina soils are in the lower lying swales, and Treaty soils are in small drainageways and depressions. Also included are small areas of severely eroded soils. Included soils make up about 15 percent of the map unit.

The Crosby soil is slowly permeable. Available water capacity is high. Surface runoff is medium. The water table is at a depth of 1 to 3 feet during winter and early spring. Organic matter content is moderate in the surface layer. In some areas coarse fragments on or near the surface hinder tillage.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture, and a few are used for orchards or woodland.

If drained, this soil is well suited to corn, soybeans, and small grain. Most areas are drained by subsurface and surface drains. Unless they are removed, the coarse fragments can cause problems when the soil is tilled. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to maintain the organic matter content and good tilth and helps to control erosion.

If drained, this soil is well suited to grasses and legumes for hay and pasture. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted forage plants. Overgrazing or grazing under wet conditions causes surface compaction and poor tilth. Coarse fragments on or below the surface can hinder haying. They commonly are removed from the field before hay is seeded. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods minimize surface compaction and help to maintain good tilth and plant density.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation and by cutting, spraying, or girdling. The water table can hinder harvesting and and planting.

Because of the wetness, this soil is severely limited as a site for dwellings. Subsurface drains can lower the water table. The stones can cause problems in installing tile lines and footings. The dwellings should be constructed without basements. The soil is severely limited as a site for local roads and streets because of frost action. The base material should be strengthened or replaced with material that can support vehicular traffic.

Because of the wetness and the slow permeability, this soil is severely limited as a site for septic tank absorption fields. A drainage system can lower the water table. The coarse fragments can cause problems in installing the trunk lines. Enlarging the absorption field helps to overcome the restricted permeability. Filling or mounding with better suited material improves the capacity of the field to absorb the effluent.

The land capability classification is IIw. The woodland ordination symbol is 4A.

Ee—Eel silt loam, frequently flooded. This nearly level, deep, moderately well drained soil is on flood plains. Areas are elongated or irregularly shaped and are 3 to 35 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsurface layer also is dark grayish brown silt loam. It is about 4 inches thick. The upper part of the underlying material is dark brown and brown, mottled, friable loam. The next part is dark gray and pale brown, mottled loam that has thin strata of silty clay loam. The lower part to a depth of 60 inches is light brownish gray, mottled loam that has thin strata of silty clay loam and sandy loam. In some areas the soil has no carbonates. In a few areas the surface layer is darker. In places the surface soil is browner.

Included with this soil in mapping are small areas of the well drained Allison Variant soils. These soils commonly are on the highest part of the landscape. Also included are small areas of the very poorly drained Sloan soils in depressions. Included soils make up about 10 percent of the map unit.

The Eel soil is moderately permeable. Available water capacity is very high. Surface runoff is slow. The water table is at a depth of 1.5 to 3.0 feet during winter and early spring. Organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for pasture, woodland, or specialty crops.

This soil is well suited to corn, soybeans, and small grain. Flooding is a hazard, but it normally occurs before the major crops are planted. It can be controlled in some areas by levees, field ditches, and properly located diversions, all of which intercept runoff from the higher areas. Winter cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface improve tilth and increase the organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. Flooding can damage these plants in winter and early in spring. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, and restricted use during wet periods minimize surface compaction and help to maintain good tilth and plant density.

This soil is well suited to trees. Plant competition is the main management concern. The frequent flooding is a hazard in winter. It can delay logging activities. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, or girdling.

Because of the flooding and the wetness, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. It is severely limited as a site for local roads because of frost action and flooding. Fill material can elevate the roadbed. Culverts improve drainage and help to control flooding. Levees also help to control flooding. The base material should be strengthened or replaced with material that can support vehicular traffic.

The land capability classification IIw. The woodland ordination symbol is 8A.

EnA—Eldean Variant loam, 0 to 2 percent slopes. This nearly level, well drained soil is on stream terraces. It is moderately deep over gravelly loamy coarse sand. Areas are irregular in shape and are 3 to 35 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsoil is about 17 inches thick. It is dark reddish brown and firm. The upper part is clay loam, the next part is gravelly clay, and the lower part is very gravelly coarse sandy loam. The underlying material to a depth of 60 inches is reddish brown and pale brown, calcareous gravelly loamy coarse sand. In some areas the surface layer is lighter colored and is thinner. In other areas the slope is more than 2 percent. In places the subsoil has less clay.

Included with this soil in mapping are small areas of the very poorly drained Westland soils in depressions and the somewhat poorly drained Sleeth soils on the slightly convex parts of the landscape. Also included are small areas of severely eroded soils. Included soils make up about 10 percent of the map unit.

The Eldean Variant soil is moderately slowly permeable to moderately rapidly permeable in the subsoil and moderately rapidly permeable to very rapidly permeable in the underlying material. Available water capacity is low. Surface runoff is slow. Organic matter content is moderate in the surface layer. This layer is friable and can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some small areas are used for hay, pasture, or specialty crops.

This soil is well suited to corn, soybeans, and small grain. If irrigated and properly managed, it is well suited to intensive row cropping. Droughtiness is the main limitation. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface improve tilth and increase the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa, for hay and pasture. The amount of moisture is insufficient during dry periods. Overgrazing reduces plant density and plant hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods minimize surface compaction and help to maintain good tilth and plant density.

This soil is well suited to trees. Plant competition is the main management concern. It can be controlled by proper site preparation and by cutting, spraying, or girdling.

This soil is suitable as a site for dwellings. The sides of shallow excavations can cave in unless they are reinforced. The soil is moderately limited as a site for local roads and streets because of frost action. Providing coarse textured subgrade or base material helps to prevent the damage caused by frost action. The soil is severely limited as a site for septic tank absorption fields because the effluent can pollute the underground water supply. Installing the field in more loamy fill material reduces this hazard.

The land capability classification is IIs. The woodland ordination symbol is 5A.

FcA—Fincastle-Crosby silt loams, 0 to 1 percent slopes. These nearly level, deep, somewhat poorly drained soils are on broad till plains. The Fincastle soil is on broad flats. The Crosby soil is on slight rises. Areas are irregular in shape and are 5 to 150 acres in size. The dominant size is about 40 acres. The areas are about 55 percent Fincastle soil and 35 percent Crosby soil.

Typically, the Fincastle soil has a surface layer of dark grayish brown silt loam about 9 inches thick. The subsurface layer is grayish brown silt loam about 3 inches thick. The subsoil is about 33 inches thick. The upper part is yellowish brown, mottled, firm silty clay loam, and the lower part is grayish brown, mottled, firm silt loam. The underlying material to a depth of 60 inches is yellowish brown, calcareous loam. In places the subsoil has layers of clay loam as much as 10 inches thick. In a few places the soil has more gravel in the lower part. In a few areas the subsoil has more clay. In a few places it is thicker.

Typically, the Crosby soil has a surface layer of dark grayish brown silt loam about 11 inches thick. The subsoil is about 11 inches thick. The upper part is yellowish brown, mottled, firm clay loam; the next part is dark yellowish brown, mottled, firm clay; and the lower part is yellowish brown, mottled, firm clay loam. The underlying material to a depth of 60 inches is light yellowish brown, calcareous loam. In a few areas the subsoil has less clay. In a few places it has more gravel in the lower part. In some small areas the depth to the underlying material is less than 18 inches.

Included with these soils in mapping are small areas of the moderately well drained Celina soils on dome-shaped slopes and the very poorly drained Treaty soils in small drainageways and depressions. Also included are small areas of severely eroded soils. Included soils make up about 10 percent of the map unit.

The Fincastle soil is moderately permeable in the subsoil and moderately slowly permeable in the underlying material. The Crosby soil is slowly permeable. Available water capacity is high in both soils. Surface runoff is slow. The water table is at a depth of 1 to 3 feet during winter and early spring. Organic matter content is moderate in the surface layer. This layer is friable and can be tilled throughout a fairly wide range in moisture content.

Most areas of these soils are used for cultivated crops. Some are used for hay or pasture, and a few are used for orchards or woodland.

If drained, these soils are well suited to corn, soybeans, and small grain. Most areas are drained by surface and subsurface drains. Winter cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface help to maintain the organic matter content and good tilth.

If drained, these soils are well suited to grasses and legumes for hay and pasture. Deep-rooted legumes, such as alfalfa, are not so well suited as shallow-rooted forage plants. Overgrazing or grazing under wet conditions causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods minimize surface compaction and help to maintain good tilth and plant density.

These soils are well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation and by cutting, spraying, or girdling. The high water table can hinder harvesting and planting.

Because of the wetness, these soils are severely limited as sites for dwellings. Subsurface drains can lower the water table. The dwellings should be constructed without basements. The soils are severely limited as sites for local roads and streets because of low strength and frost action. The base material should be strengthened or replaced with material that can support vehicular traffic.

Because of the wetness and the moderately slow or slow permeability, these soils are severely limited as sites for septic tank absorption fields. A drainage system can lower the water table. Enlarging the absorption field helps to overcome the restricted permeability. Filling or mounding with better suited material improves the capacity of the field to absorb the effluent.

The land capability classification is IIw. The woodland ordination symbol is 4A.

FoA—Fox loam, 0 to 2 percent slopes. This nearly level, well drained soil is on broad stream terraces along the valleys of the major streams. It is moderately deep over sand and gravel. Areas are elongated or irregularly shaped and are 5 to 50 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsurface layer also is dark brown loam. It is about 4 inches thick. The subsoil is about 26 inches thick. The upper part is dark brown, firm loam; the next part is brown, firm clay loam; and the lower part is reddish brown, firm sandy clay loam. The underlying material to a depth of 80 inches is calcareous. It is yellowish brown gravelly loamy coarse sand in the upper part, yellowish brown gravelly sand in the next part, and brown gravelly loamy sand in the lower part. In places the surface layer is sandy loam or clay loam. In some areas the subsoil is clay or silty clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Sleeth and very poorly drained Westland soils in the slightly lower positions on the landscape. These soils make up about 5 to 8 percent of the map unit.

The Fox soil is moderately permeable in the subsoil and rapidly permeable in the underlying material. Available water capacity is moderate. Surface water runoff is slow. Organic matter content is low in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some small areas are used for pasture, hay, or woodland.

This soil is well suited to corn, soybeans, and small grain. Droughtiness is the main limitation. It can be controlled by irrigation systems. Winter cover crops help to prevent excessive soil loss. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves or helps to maintain tilth and the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa, for hay and pasture. The main management concern is a slight hazard of drought in late summer. Irrigation can reduce the droughtiness. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during dry periods help to keep the pasture in good condition.

A few areas are wooded. This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation and by cutting, spraying, or girdling.

Because of shrinking and swelling, this soil is moderately limited as a site for dwellings without basements. It is suitable as a site for dwellings with basements. Strengthening foundations and footings and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. The sides of shallow excavations can cave in unless they are reinforced. The soil is moderately limited as a site for local roads and streets because of the shrink-swell potential and frost action. Providing coarse textured subgrade or base material helps to prevent the damage caused by shrinking and swelling and by frost action.

Because of the rapid permeability in the underlying material, this soil is severely limited as a site for septic tank absorption fields. The effluent can pollute the underground water supply. Excavating the sand and gravel and filling or mounding with finer textured material can improve the filtering capacity.

The land capability classification is IIs. The woodland ordination symbol is 4A.

FoB—Fox loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on rises and knobs on stream terraces. It is moderately deep over sand and gravel. Areas are elongated or irregularly shaped and are 5 to 40 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsurface layer also is dark brown loam. It is about 3 inches thick. The subsoil is about 24 inches thick. The upper part is reddish brown and dark reddish brown, firm clay loam, and the lower part is dark reddish brown, firm sandy clay loam. The underlying material to a depth of 60 inches is yellowish brown, calcareous very gravelly coarse sand. In places the slope is less than 2 or more than 6 percent. In some areas the subsoil is thicker. In other areas it has more sand and gravel.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Sleeth soils on the slightly convex, lower lying rises and on broad flats and small areas of the very poorly drained Westland soils in depressions. Also included are a few areas where the slope is significantly more than 6 percent. Included soils make up about 7 percent of the map unit.

The Fox soil is moderately permeable in the subsoil and rapidly permeable in the underlying material. Available water capacity is low. Surface runoff is medium. Organic matter content is low in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for pasture, hay, or woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion is the main hazard. Droughtiness is a limitation. It can be controlled by irrigation systems. Winter cover crops and a cropping system that includes grasses and legumes help to prevent excessive soil loss. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves or helps to maintain good tilth and the organic matter content. The soil is well suited to no-till farming.

A cover of grasses and legumes, such as bromegrass, orchardgrass, and alfalfa, for hay and pasture is effective in controlling erosion. The main management concern is a slight hazard of drought in late summer. Irrigation can reduce the droughtiness. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during dry periods minimize surface compaction and help to maintain good tilth and plant density.

A few areas are wooded. This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation and by cutting, spraying, or girdling.

Because of shrinking and swelling, this soil is moderately limited as a site for dwellings without basements. It is suitable as a site for dwellings with basements. Strengthening foundations and footings and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. The sides of shallow excavations can cave in unless they are reinforced. The soil is moderately limited as a site for local roads and streets because of frost action and shrinking and swelling. Providing coarse textured subgrade or base material helps to prevent the damage caused by shrinking and swelling and by frost action.

Because of the rapid permeability in the underlying material, this soil is severely limited as a site for septic tank absorption fields. The effluent can pollute the underground water supply. Excavating the sand and gravel and replacing it with finer textured material can improve the filtering capacity.

The land capability classification is IIe. The woodland ordination symbol is 4A.

FxC3—Fox clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, well drained soil is on side slopes along small drainageways on stream terraces. It is moderately deep over sand and gravelly sand. Areas are elongated or irregularly shaped and are 5 to 25 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is dark yellowish brown clay loam about 7 inches thick. It has many chunks of yellowish brown sandy clay loam. The subsoil is about 24 inches thick. The upper part is yellowish brown and dark brown, firm sandy clay loam, and the lower part is yellowish brown, firm sandy loam. The underlying material to a depth of 60 inches is yellowish brown, calcareous sand and gravelly sand. In some areas the slope is less than 6 percent or more than 12 percent. In some places the subsoil is thicker. In other places it has more sand and gravel.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Sleeth soils on slight rises and broad flats. These soils make up about 8 percent of the map unit.

The Fox soil is moderately permeable in the subsoil and rapidly permeable in the underlying material. Available water capacity is low. Surface runoff is rapid. Organic matter content is low in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet.

Most areas of this soil are used for hay, pasture, or woodland. Some are used for cultivated crops. A few are used as upland wildlife habitat.

This soil is poorly suited to corn, soybeans, and small grain. Further erosion is a severe hazard, and droughtiness is a limitation. If cultivated crops are grown, measures that control surface runoff and erosion are needed. Examples are conservation tillage, a cropping system that includes grasses and legumes, diversions, grassed waterways, grade stabilization structures, and winter cover crops. The soil is well suited to no-till farming. Winter cover crops and crop residue management help to control erosion and improve or maintain tilth and the organic matter content.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa, for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during dry periods minimize surface compaction and help to maintain good tilth and plant density.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation and by cutting, spraying, or girdling.

Because of the slope and the shrink-swell potential, this soil is moderately limited as a site for dwellings. Strengthening foundations and footings and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. Grading, cutting, and filling help to modify the slope. Also, the dwellings can be designed so that they conform to the natural slope of the land. The sides of shallow excavations can cave in unless they are reinforced. The soil is moderately limited as a site for local roads and streets because of frost action, shrinking and swelling, and slope. Providing coarse textured subgrade or base material helps to prevent the damage caused by shrinking and swelling and by frost action. Land shaping and building on the contour help to overcome the slope.

Because of the rapid permeability in the underlying material, this soil is severely limited as a site for septic tank absorption fields. The effluent can pollute the underground water supply. Installing the absorption field in loamy fill material reduces this hazard.

The land capability classification is IVe. The woodland ordination symbol is 4A.

GnB2—Glynwood silt loam, 1 to 4 percent slopes, eroded. This gently sloping, deep, moderately well drained soil is on knolls and short, uneven side slopes along drainageways on till plains and moraines. Areas are irregularly shaped or elongated and are 3 to 200 acres in size. The dominant size is about 50 acres.

Typically, the surface layer is grayish brown silt loam about 8 inches thick. The subsoil is dark brown, mottled, firm clay about 18 inches thick. The underlying material to a depth of 60 inches is brown and yellowish brown, calcareous clay loam. In places the subsoil is thicker. In a few areas the surface layer has more clay. In some areas the soil has a slope of more than 6 percent and is severely eroded.

Included with this soil in mapping are small areas of the somewhat poorly drained Blount soils on broad flats and slight rises and the well drained Morley soils on narrow ridgetops and on side slopes along small drainageways and the major streams. Also included are a few small areas of the very poorly drained Pewamo soils in shallow depressions and on broad flats. Included soils make up about 6 percent of the map unit.

The Glynwood soil is slowly permeable. Available water capacity is moderate. Surface runoff is medium. The water table is at a depth of 2.0 to 3.5 feet during winter and early spring. Organic matter content is low in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for pasture, hay, or woodland.

This soil is fairly well suited to corn, soybeans, and small grain. Erosion is the main hazard if cultivated crops are grown. A system of conservation tillage that leaves protective amounts of crop residue on the surface, a crop rotation that includes grasses and legumes, diversions, stripcropping, grassed waterways, and grade stabilization structures help to control surface runoff and erosion. Returning crop residue to the soil and growing cover crops help to control erosion and improve or maintain tilth and the organic matter content. In seepy areas in some of the drainageways and swales, subsurface drains are needed.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as clover and alfalfa, for hay and pasture (fig. 5). A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, and timely deferment of grazing help to keep the pasture in good condition.

A few small areas are wooded. This soil is well suited to trees. Seedling mortality, windthrow, and plant competition are management concerns. Special site preparation, such as establishing wide, shallow furrows in which to plant the trees, reduces the seedling mortality rate. Windthrown trees should be periodically removed. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, or girdling.

Because of the wetness and the shrink-swell potential, this soil is limited as a site for dwellings. Because of the wetness, it should not be used as a site for dwellings with basements. Foundation drains are needed to

Figure 5.—Hay in an area of Glynwood silt loam, 1 to 4 percent slopes, eroded.

remove excess water. Strengthening foundations and footings and backfilling with coarse textured material help to prevent the damage caused by shrinking and swelling. The soil is moderately limited as a site for local roads and streets because of frost action. Providing coarse textured subgrade or base material helps to prevent the damage caused by frost action. Roadside ditches help to remove excess water and thus reduce the hazard of frost action.

Because of the slow permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome the restricted permeability. Filling or mounding with better suited material improves the capacity of the field to absorb the effluent. Perimeter drains can remove excess surface and subsurface water.

The land capability classification is IIIe. The woodland ordination symbol is 4C.

LnB2—Losantville silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on side slopes and the tops of ridges on till plains. Areas are irregularly shaped or elongated and are 3 to 45 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil is firm clay loam about 12 inches thick. The upper part is dark yellowish brown, and the lower part is yellowish brown. The underlying material to a depth of 60 inches is yellowish brown, calcareous loam. In some places the soil has a slope of more than 6 percent and is severely eroded. In other places the subsoil has less clay. In a few places it is thinner. In some areas gray mottles are in the lower part of the subsoil. In a few areas the surface layer is loam or clay loam.

Included with this soil in mapping are small areas of the moderately well drained Celina and poorly drained Patton soils. Also included are a few areas where gravel and stones are on the surface. Included soils make up about 8 percent of the map unit.

The Losantville soil is moderately slowly permeable in the subsoil and slowly permeable in the underlying material. Available water capacity is moderate. Surface runoff is medium. The water table is at a depth of 4 to 6 feet during winter and spring. Organic matter content is low in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for pasture, hay, or woodland.

This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control surface runoff and erosion are needed. Examples are a cropping system that includes grasses and legumes, diversions, stripcropping, grassed waterways, and grade stabilization structures. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves or helps to maintain good tilth and the organic matter content. The soil is well suited to no-till farming. In seepy areas on side slopes and in some of the drainageways and swales, a subsurface drainage system is needed.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa, for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A few areas are wooded. This soil is well suited to trees. Plant competition is the main management concern. It can be controlled by proper site preparation and by cutting, spraying, or girdling.

This soil is suitable as a site for dwellings without basements. It is moderately limited as a site for dwellings with basements because of the wetness. Foundation drains are needed. The soil is moderately limited as a site for local roads and streets because of frost action. Providing coarse textured subgrade or base material helps to prevent the damage caused by frost action.

Because of the slow permeability in the underlying material, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field helps to overcome this limitation. Also, filling or mounding with better suited material improves the capacity of the field to absorb the effluent.

The land capability classification is IIe. The woodland ordination symbol is 4A.

LnE—Losantville loam, 18 to 25 percent slopes. This moderately steep, deep, well drained soil is on knolls and on the side slopes of deep drainageways on till plains. Areas are irregular in shape and are 5 to 25 acres in size. The dominant size is about 8 acres.

Typically, the surface layer is dark yellowish brown loam about 5 inches thick. The subsoil is yellowish brown, firm clay loam about 7 inches thick. The underlying material to a depth of 60 inches is yellowish brown, calcareous loam. In a few places the subsoil is thinner. In some areas it has gray mottles in the lower part. In a few areas the surface layer is loam or clay loam. In places the subsoil has less clay.

Included with this soil in mapping are a few narrow areas of less sloping, more eroded soils near the top of the slopes. Also included are small areas where gravel and stones are on the surface. Included soils make up about 9 percent of the map unit.

The Losantville soil is moderately slowly permeable in the subsoil and slowly permeable in the underlying material. Available water capacity is moderate. Surface runoff is very rapid. The water table is at a depth of 4 to

6 feet during winter and spring. Organic matter content is low in the surface layer.

Most areas of this soil are used as pasture or woodland. A few small areas are used as wildlife habitat. Because of the slope, this soil is generally unsuitable as cropland and is poorly suited to grasses and legumes for pasture. Pasture plants can be established in the less sloping included areas, but access to these areas may be difficult.

Many small areas are wooded. Most wooded areas are grazed. This soil is fairly well suited to trees. The erosion hazard, the equipment limitation, and plant competition are the main management concerns. Selective cutting rather than clearcutting, constructing haul roads on the contour, and preserving as much of the understory as possible help to control erosion. Specialized equipment and careful planning of logging activities are needed. Plant competition can be controlled by herbicides, cutting, girdling, and proper site preparation.

This soil is generally unsuitable as a site for dwellings because of the slope and as a site for septic tank absorption fields because of the slow permeability and the slope. The slope is a severe limitation on sites for local roads. Cutting and filling are needed, and the roads should be built on the contour if possible. A better suited site should be considered.

The land capability classification is VIe. The woodland ordination symbol is 4R.

LoC3—Losantville clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on narrow ridgetops and side slopes along natural drainageways on till plains. Areas are narrow and irregularly shaped and are 5 to 50 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is brown clay loam about 8 inches thick. In most areas, nearly all of the original darkened surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. The subsoil is yellowish brown, firm clay about 14 inches thick. The underlying material to a depth of 60 inches is brown, calcareous loam. In some areas the soil is shallower to the underlying material. In a few places the surface layer is dark brown and dark yellowish brown. In places gray mottles are in the lower part of the subsoil. In a few areas the surface layer is loam or silt loam. In a few places the loam till is at the surface.

Included with this soil in mapping are small areas of the moderately well drained Celina soils, mainly on the wider ridgetops. Also included are a few areas where gravel and small stones are on the surface. Included soils make up about 8 percent of the map unit.

The Losantville soil is moderately slowly permeable in the subsoil and slowly permeable in the underlying material. Available water capacity is moderate. Surface runoff is rapid. The water table is at a depth of 4 to 6 feet during winter and spring. Organic matter content is low in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. As a result, seedbed preparation is difficult.

Most areas of this soil are used for cultivated crops. Some are used for pasture, hay, woodland, wildlife habitat, or recreational development.

This soil is poorly suited to corn, soybeans, and small grain. Erosion and surface runoff are the main management concerns if cultivated crops are grown. A cropping system that includes grasses and legumes, diversions, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves or helps to maintain tilth and the organic matter content. The soil is well suited to no-till farming. In seepy areas in some of the drainageways and swales, a subsurface drainage system is needed.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa, for pasture. It is fairly well suited to hay. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, poor tilth, excessive runoff, and reduced plant density. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A few areas are wooded. This soil is well suited to trees. Plant competition is the main management concern. It can be controlled by proper site preparation and by cutting, spraying, or girdling.

This soil is moderately limited as a site for dwellings because of the slope and the wetness. Grading can modify the slope. Also, the dwellings can be designed so that they conform to the natural slope of the land. A drainage system around footings and foundations can remove excess water. The soil is moderately limited as a site for local roads and streets because of the slope and frost action. Providing coarse textured subgrade or base material helps to prevent the damage caused by frost action. A drainage system along the roads also decreases the potential for frost action. Land shaping and building on the contour help to overcome the slope.

Because of the slow permeability in the underlying material, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field and installing the distribution lines on the contour help to overcome the restricted permeability. Also, filling or mounding with better suited material improves the capacity of the field to absorb the effluent.

The land capability classification is IVe. The woodland ordination symbol is 4A.

LoD3—Losantville clay loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on ridges and side slopes along deep drainageways on till plains. Areas are irregular in shape and are 5 to 25 acres in size. The dominant size is about 7 acres.

Typically, the surface layer is dark brown clay loam about 7 inches thick. In most areas, nearly all of the original darkened surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. The subsoil is brown, firm clay loam about 9 inches thick. The underlying material to a depth of 60 inches is yellowish brown, firm, calcareous loam. In some areas the soil is shallower to the underlying material. In some places gray mottles are in the lower part of the subsoil. In other places the soil has a slope of less than 12 percent and is less eroded. In a few places the surface layer is loam or silt loam. In some areas the loam till is at the surface.

Included with this soil in mapping are small areas where gravel and stones are on the surface. Included soils make up about 9 percent of the map unit.

The Losantville soil is moderately slowly permeable in the subsoil and slowly permeable in the underlying material. Available water capacity is moderate. Surface runoff is very rapid. The water table is at a depth of 4 to 6 feet during winter and spring. Organic matter content is low in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. As a result, seedbed preparation is difficult.

Most areas of this soil are used for hay, pasture, or woodland. Some small areas are used for cultivated crops. Because of the hazard of erosion, this soil is generally unsuited to corn, soybeans, and small grain. It is fairly well suited to grasses and legumes for pasture but is poorly suited to hay. A cover of pasture plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and excessive runoff. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

Many areas are wooded. Most wooded areas are grazed. This soil is fairly well suited to trees. Selective cutting rather than clearcutting, constructing haul roads on the contour, and preserving as much of the understory as possible help to control erosion. Because of the slope, operating logging and planting equipment is difficult. Specialized equipment and careful planning of logging and planting activities are needed.

This soil is severely limited as a site for dwellings, local roads and streets, and septic tank absorption fields because of the slope. Also, the slow permeability is a severe limitation on sites for septic tank absorption fields. Constructing the buildings, local roads, and septic tank absorption fields on the contour and land shaping help to overcome the slope. Filling or mounding with better suited material improves the capacity of the absorption fields to absorb effluent.

The land capability classification is VIe. The woodland ordination symbol is 4R.

LsB2—Losantville silt loam, stony subsoil, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on till plains and moraines. Areas are long and narrow or irregularly shaped and are 3 to 30 acres in size. The dominant size is about 8 acres.

Typically, the surface layer is dark brown silt loam about 6 inches thick. Part of the darkened surface layer has been mixed with the upper part of the subsoil. The subsoil is firm clay loam about 12 inches thick. It is yellowish brown in the upper part and dark yellowish brown in the lower part. It has stones more than 11 inches in diameter. The underlying material to a depth of 60 inches is yellowish brown and light yellowish brown, calcareous loam. In some small, severely eroded areas, the soil is shallower to the underlying material. In places gray mottles are in the lower part of the subsoil. In a few small areas, the surface layer is loam or clay loam. In some areas the loam till is at the surface.

Included with this soil in mapping are very small areas of the moderately well drained Celina soils that have a stony subsoil. These soils are on rises and knolls. Also included are the very poorly drained Treaty soils in depressions and a few areas where gravel and stones are on the surface. Included soils make up about 10 percent of the map unit.

The Losantville soil is moderately slowly permeable in the subsoil and slowly permeable in the underlying material. Available water capacity is moderate. Surface runoff is medium. The water table is at a depth of 4 to 6 feet during winter and spring. Organic matter content is low in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content. In some areas, however, coarse fragments on or near the surface can hinder tillage.

Most areas of this soil are used for cultivated crops. A few small areas are used for pasture, hay, or woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion is the main hazard, and the content of coarse fragments is the main limitation. Unless they are removed, the coarse fragments can cause problems when the soil is tilled. Measures that control surface runoff and erosion are needed if cultivated crops are grown. A cropping system that includes grasses and legumes, diversions, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves or helps to maintain good tilth and the organic matter content. The soil is well suited to no-till farming. In seepy areas in some of the drainageways and swales, a subsurface drainage system is needed.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa, for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. Unless they are removed, coarse fragments on and below the surface can hinder haying. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A few areas are wooded. This soil is well suited to trees. Plant competition is the main management concern. It can be controlled by proper site preparation and by cutting, spraying, or girdling.

This soil is suitable as a site for dwellings without basements. It is moderately limited as a site for dwellings with basements because of the wetness. The coarse fragments can cause problems when excavations are made for basements and footings. Drains around foundations, footings, and basement walls help to remove excess water. The soil is moderately limited as a site for local roads and streets because of frost action. Providing coarse textured subgrade or base material helps to prevent the damage caused by frost action.

Because of the slow permeability, this soil is severely limited as a site for septic tank absorption fields. The coarse fragments can hinder installation of the trunk lines. Enlarging the absorption field helps to overcome the restricted permeability. Also, filling or mounding with better suited material improves the capacity of the field to absorb the effluent.

The land capability classification is IIe. The woodland ordination symbol is 4A.

LtC3—Losantville clay loam, stony subsoil, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on ridges and side slopes along the major drainageways on till plains and moraines. Areas are irregularly shaped or elongated and are 4 to 45 acres in size. The dominant size is about 12 acres.

Typically, the surface layer is dark brown clay loam about 4 inches thick. In most areas, nearly all of the original darkened surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. The subsoil is yellowish brown, firm clay loam about 7 inches thick. It has stones more than 10 inches in diameter. The underlying material to a depth of 60 inches is light yellowish brown, calcareous loam. In some areas the soil is shallower to the underlying material. In a few places the surface layer is dark yellowish brown. In some places gray mottles are in the lower part of the subsoil. In other places the surface layer is loam or silt loam. In a few areas the loam till is at the surface.

Included with this soil in mapping are small areas of the moderately well drained Celina soils, mainly on the wider ridgetops. Also included are a few areas of soils that have fewer pebbles and stones on the surface than the Losantville soil. Included soils make up about 12 percent of the map unit.

The Losantville soil is moderately slowly permeable in the subsoil and slowly permeable in the underlying material. Available water capacity is moderate. Surface runoff is rapid. The water table is at a depth of 4 to 6 feet during winter and spring. Organic matter content is low in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. As a result, seedbed preparation is difficult. In some areas the stones on or near the surface can hinder tillage.

Most areas of this soil are used for cultivated crops. Some are used for pasture, hay, woodland, wildlife habitat, or recreational development (fig. 6).

This soil is poorly suited to corn, soybeans, and small grain. It can be occasionally used for row crops. Erosion and surface runoff are the main hazards. Unless they are removed, the coarse fragments can cause problems when the soil is tilled. A cropping system that includes grasses and legumes, diversions, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves or helps to maintain tilth and the organic matter content. The soil is well suited to no-till farming. In seepy areas in some of the drainageways and swales, a subsurface drainage is needed.

This soil is fairly well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa, for hay and pasture. It is suited to hay. A cover of grasses and legumes is effective in controlling erosion. Unless they are removed, the coarse fragments on and below the surface can hinder haying. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A few areas are wooded. This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation and by cutting, spraying, or girdling.

This soil is moderately limited as a site for dwellings because of the wetness and the slope. The coarse fragments can cause problems when excavations are made for basements and footings. Grading can modify the slope. Also, the dwellings can be designed so that they conform to the natural slope of the land. Drains around footings and foundations reduce the wetness. The soil is moderately limited as a site for local roads and streets because of the slope and frost action. Providing coarse textured subgrade or base material helps to prevent the damage caused by frost action.

Figure 6.—A campground in an area of Losantville clay loam, stony subsoil, 6 to 12 percent slopes, severely eroded. This area is adjacent to Lake Modoc.

Land shaping and building on the contour help to overcome the slope.

Because of the slow permeability in the underlying material, this soil is severely limited as a site for septic tank absorption fields. The coarse fragments can hinder installation of the trunk lines. Enlarging the absorption field helps to overcome the restricted permeability. Also, filling or mounding with better suited material improves the capacity of the field to absorb the effluent.

The land capability classification is IVe. The woodland ordination symbol is 4A.

LtD3—Losantville clay loam, stony subsoil, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on ridges and side slopes along the major drainageways on till plains and moraines. Areas are irregularly shaped or elongated and are 3 to 40 acres in size. The dominant size is about 7 acres.

Typically, the surface layer is dark brown clay loam about 4 inches thick. In most areas, nearly all of the original darkened surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. The subsoil is brown, firm clay loam about 7 inches thick. It has stones more than 10 inches in diameter. The underlying material to a depth of 60 inches is yellowish brown, calcareous loam. In some areas the soil is shallower to the underlying material. In other areas gray mottles are in the lower part of the subsoil. In some places the slope is less than 12 percent. In other places the surface layer is loam or silt loam. In a few areas the loam till is at the surface.

Included with this soil in mapping are small areas of steeply sloping soils along drainageways and streams. These soils make up about 10 percent of the map unit.

The Losantville soil is moderately slowly permeable in the subsoil and slowly permeable in the underlying material. Available water capacity is moderate. Surface runoff is very rapid. The water table is at a depth of 4 to 6 feet during winter and spring. Organic matter content is low in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. As a result, seedbed preparation is difficult. The stones on or near the surface can hinder tillage.

Most areas of this soil are used for hay, pasture (fig. 7), woodland, or wildlife habitat. Some small areas are used for cultivated crops. Because of the hazard of further erosion and the slope, this soil is generally unsuited to corn, soybeans, and small grain. It is fairly well suited to grasses and legumes for pasture but is poorly suited to hay. Bromegrass, orchardgrass, and alfalfa are well suited forage species. Unless they are removed, the coarse fragments on and below the surface can hinder haying. Overgrazing or grazing when the soil is too wet causes surface compaction and excessive runoff. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

Many small areas are wooded. Some wooded areas are grazed. This soil is poorly suited to trees. The erosion hazard, the equipment limitation, and plant competition are the main management concerns. Selective cutting rather than clearcutting, constructing haul roads on the contour, and preserving as much of the understory as possible help to control erosion. Because of the slope, operating logging and planting equipment is difficult. Specialized equipment and careful planning of logging and planting activities are needed. Plant competition can be controlled by herbicides, cutting, girdling, and proper site preparation.

This soil is severely limited as a site for dwellings, local roads and streets, and septic tank absorption fields

Figure 7.—A pastured area of Losantville clay loam, stony subsoil, 12 to 18 percent slopes, severely eroded.

because of the slope. Also, the slow permeability is a severe limitation on sites for septic tank absorption fields. Constructing the buildings, local roads, and septic tank absorption fields on the contour and land shaping help to overcome the slope. Filling or mounding with better suited material improves the capacity of the absorption fields to absorb effluent.

The land capability classification is VIe. The woodland ordination symbol is 4R.

Lw—Linwood muck, undrained. This nearly level, deep, very poorly drained soil is in deep depressions on uplands and stream terraces. It is subject to ponding. Areas are generally oval and are 3 to 15 acres in size. The dominant size is about 7 acres.

Typically, the surface layer is black muck about 7 inches thick. The next 8 inches also is black muck. Below this is yellowish red muck about 3 inches thick. The underlying material to a depth of 60 inches is olive gray and grayish brown, calcareous clay loam. In some areas the organic material is less than 16 inches thick. In places the slope is more than 2 percent.

Included with this soil in mapping are small areas of the poorly drained Patton and very poorly drained Pewamo and Treaty soils. These soils are at the slightly higher elevations around the edges of the mapped areas. Also included, in the slightly deeper depressions, are small areas where the organic material is more than 50 inches thick. Included soils make up about 15 percent of the map unit.

The Linwood soil is moderately slowly permeable to moderately rapidly permeable in the organic material and moderately permeable in the underlying material. Available water capacity is very high. Surface runoff is very slow or ponded. The water table is near or above the surface during winter and early spring. Organic matter content is very high in the surface layer. This layer is friable and can be easily tilled if the soil is drained.

This soil supports cattails, reeds, sedges, marsh grasses, buttonbush, redosier dogwood, willows, and soft maple or other water-tolerant trees or shrubs. It is generally unsuitable as cropland and hayland and is poorly suited to pasture. It is well suited to wetland wildlife habitat. The natural vegetation provides good habitat for wetland wildlife. It furnishes abundant protective cover and a sufficient amount of available food, mainly from seed-bearing shrubs.

This soil is poorly suited to woodland. The main management concerns are the equipment limitation, seedling mortality, and windthrow. Equipment should be used only when the ground is frozen. Special site preparation, such as bedding, is needed in some areas. Harvest methods that do not isolate the remaining trees or leave them too widely spaced reduce the windthrow hazard.

Because of ponding and low strength, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of ponding, subsidence of the organic material, and frost action. Overcoming these limitations are very difficult. Replacing the organic material with suitable soil material helps to prevent subsidence. Constructing the roads on raised, well compacted fill material and providing adequate roadside ditches and culverts help to prevent the damage caused by ponding and frost action.

The land capability classification is Vw. The woodland ordination symbol is 2W.

MoA—Miami silt loam, gravelly substratum, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on broad flats and the tops of ridges on till plains. Areas are irregular in shape and are 5 to 60 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 22 inches thick. The upper part is dark yellowish brown, firm silt loam, and the lower part is brown, firm silty clay loam and clay loam. The underlying material to a depth of 80 inches is calcareous. It is brown loam in the upper part and reddish brown gravelly sandy clay loam in the lower part. In places the soil has more than 35 inches of loess and has less sand in the upper part of the subsoil. In some areas the underlying material has more sand and gravel.

Included with this soil in mapping are small areas of the poorly drained Patton and very poorly drained Treaty soils in depressions. Also included are small areas of soils that have stones on the surface and in the subsoil. Included soils make up about 10 percent of the map unit.

The Miami soil is moderately permeable in the upper part and is rapidly permeable in the lower part of the underlying material. Available water capacity is high. Surface runoff is slow. Organic matter content is low in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for pasture, hay, or woodland.

This soil is well suited to corn, soybeans, and small grain. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves or helps to maintain good tilth and the organic matter content. The soil is well suited to no-till farming. Erosion is a problem in the included areas where the slope is 2 to 3 percent.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa, for hay and pasture. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A few areas are wooded. This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation and by cutting, spraying, or girdling.

Because of shrinking and swelling, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of low strength. Providing coarse textured subgrade or base material helps to prevent the damage caused by low strength. The restricted permeability is a limitation on sites for septic tank absorption fields. Filling or mounding with better suited material improves the capacity of the field to absorb the effluent.

The land capability classification is I. The woodland ordination symbol is 5A.

MoB2—Miami silt loam, gravelly substratum, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on knolls and the tops of ridges on till plains. Areas are irregular in shape and are 3 to 80 acres in size. The dominant size is about 20 acres.

Typically, the surface layer is brown silt loam about 10 inches thick. Part of the darkened surface layer has been mixed with the upper part of the subsoil. The subsoil is about 22 inches thick. The upper part is dark yellowish brown silt loam, and the lower part is brown, firm silty clay loam and clay loam. The underlying material to a depth of 80 inches is calcareous. It is brown, massive loam in the upper part and reddish brown gravelly sandy clay loam in the lower part. In places the soil has more than 35 inches of loess and has less sand in the upper part of the subsoil. In a few areas the underlying material has more sand and gravel.

Included with this soil in mapping are small areas of the poorly drained Patton and very poorly drained Treaty soils in depressions. Also included are small areas of soils that have stones on the surface and in the subsoil. Included soils make up about 12 percent of the map unit.

The Miami soil is moderately permeable in the upper part and is rapidly permeable in the lower part of the underlying material. Available water capacity is high. Surface runoff is medium. Organic matter content is low in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for pasture (fig. 8), hay, or woodland.

This soil is well suited to corn, soybeans, and small grain. Measures that control surface runoff and erosion are needed if cultivated crops are grown. A cropping system that includes grasses and legumes, terraces, diversions, stripcropping, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves or helps to maintain good tilth and the organic matter content. The soil is well suited to no-till farming. In seepy areas in some of the drainageways and swales, a subsurface drainage system is needed.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa, for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A few areas are wooded. This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

Because of the shrinking and swelling, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of low strength. Providing coarse textured subgrade or base material helps to prevent the damage caused by low strength. The soil is moderately limited as a site for septic tank absorption fields because of the restricted permeability. Enlarging the absorption field helps to overcome this limitation. Also, filling or mounding with better suited material improves the capacity of the field to absorb the effluent.

The land capability classification is IIe. The woodland ordination symbol is 5A.

MuB—Morley silt loam, 3 to 6 percent slopes. This gently sloping, deep, well drained soil is on knobs and the tops of ridges on till plains and moraines. Areas are long and irregularly shaped and are 3 to 45 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 24 inches thick. The upper part is yellowish brown, firm silty clay loam and silty clay; the next part is dark yellowish brown, firm clay; and the lower part is brown, firm silty clay loam. The underlying material to a depth of 60 inches is pale brown, calcareous silty clay loam. In some places the soil is shallower to the underlying material, and in other places it is deeper to the underlying material. In a few areas the underlying material is loam till. In some areas the subsoil is loamy.

Included with this soil in mapping are small areas of the moderately well drained Glynwood soils on knolls and on short, uneven slopes along drainageways and the very poorly drained Pewamo soils in shallow depressions and small drainageways. Also included are a few small areas of severely eroded soils. Included soils make up about 15 percent of the map unit.

Figure 8.—Fescue pasture in an area of Miami silt loam, gravelly substratum, 2 to 6 percent slopes, eroded.

The Morley soil is moderately slowly permeable in the subsoil and slowly permeable in the underlying material. Available water capacity is moderate. Surface runoff is medium. Organic matter content is low in the surface layer. This layer is friable and can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for pasture, hay, or woodland.

This soil is well suited to corn, soybeans, and small grain. Measures that control surface runoff and erosion are needed if cultivated crops are grown. A cropping system that includes grasses and legumes, diversions, stripcropping, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves or helps to maintain good tilth and the organic matter content. The soil is well suited to no-till farming. In seepy areas in some of the drainageways and swales, a subsurface drainage system is needed.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa, for hay and pasture. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, and timely deferment of grazing help keep the pasture in good condition.

Some small areas are wooded. This soil is well suited to trees. Plant competition is the main management concern. It can be controlled by cutting, spraying, or girdling.

Because of the shrinking and swelling, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of low strength. Providing coarse textured subgrade or base material helps to prevent the damage caused by low strength. The soil is severely limited as a site for septic tank absorption fields because of the slow permeability. Enlarging the absorption field helps to overcome this limitation. Also, filling or mounding with better suited material improves the capacity of the field to absorb the effluent.

The land capability classification is IIe. The woodland ordination symbol is 4A.

MyC3—Morley clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on side slopes along the major drainageways on till plains and moraines. Areas are irregularly shaped or elongated and are 3 to 45 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is dark brown clay loam about 8 inches thick. In most areas, nearly all of the original darkened surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. The subsoil is about 19 inches thick. The upper part is dark yellowish brown and brown, firm silty clay, and the lower part is yellowish brown, firm clay loam. The underlying material to a depth of 60 inches is yellowish brown, calcareous clay loam. In some places the soil is shallower to the underlying material. In other places loam or clay loam till is at the surface. In a few areas the subsoil is less clayey. In some areas the surface layer is loam or silt loam.

Included with this soil in mapping are small areas of the moderately well drained Glynwood soils on knolls and ridgetops. Also included are a few small areas of strongly sloping soils and a few areas where gravel and small stones are on the surface. Included soils make up about 12 percent of the map unit.

The Morley soil is moderately slowly permeable in the subsoil and slowly permeable in the underlying material. Available water capacity is moderate. Surface runoff is rapid. Organic matter content is low in the surface layer. This layer becomes cloddy and hard to work if it is tilled when too wet. The clods are hard when dry. As a result, seedbed preparation is difficult.

Most areas of this soil are used for cultivated crops. Some are used for pasture, hay, or woodland.

This soil is poorly suited to corn, soybeans, and small grain. It can be occasionally used for row crops. Erosion and surface runoff are the main hazards. A cropping system that includes grasses and legumes, diversions, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves or helps to maintain good tilth and the organic matter content. The soil is well suited to no-till farming. In seepy areas in some of the drainageways and swales, a subsurface drainage system is needed.

This soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa and red clover, for pasture. It is fairly well suited to hay. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, poor tilth, excessive runoff, and reduced plant density and hardiness. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A few areas are wooded. This soil is well suited to trees. Plant competition is the main management concern. It can be controlled by proper site preparation and by cutting, spraying, or girdling.

Because of the shrink-swell potential and the slope, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. Grading can modify the slope. Also, the dwellings can be designed so that they conform to the natural slope of the land. Because of the erosion hazard, existing vegetation should be disturbed as little as possible during construction and those areas that are disturbed should be revegetated as soon as possible.

This soil is severely limited as a site for local roads and streets because of low strength. Providing coarse textured subgrade or base material helps to prevent the damage caused by low strength. Because of the slope, land shaping may be needed and the roads should be built on the contour if possible.

Because of the slow permeability, this soil is severely limited as a site for septic tank absorption fields. Filling or mounding with better suited material improves the capacity of the field to absorb the effluent. Installing the distribution lines on the contour or modifying the slope helps to ensure that the absorption field functions properly.

The land capability classification is IVe. The woodland ordination symbol is 4A.

Pn—Patton silty clay loam. This nearly level, deep, poorly drained soil is in depressions on broad uplands and lake plains. It is subject to ponding. Areas are oval or long and irregularly shaped and are 5 to 150 acres in size. The dominant size is about 30 acres.

Typically, the surface layer is very dark grayish brown silty clay loam about 7 inches thick. The subsurface layer is very dark grayish brown, firm silty clay loam about 4 inches thick. The subsoil is gray, mottled, firm silty clay loam about 21 inches thick. The underlying material to a depth of 80 inches is calcareous. The upper part is gray, mottled silt loam, the next part is gray silt loam that has thin strata of fine sandy loam, and the lower part is gray gravelly sandy loam. In some areas the surface layer is blacker and thicker. In other areas the soil is deeper to the underlying material. In places the subsoil has more clay. In a few areas the underlying material is sandy loam or loamy fine sand.

Included with this soil in mapping are small areas of the very poorly drained Carlisle, Linwood, and Wallkill soils in potholes and deep depressions. Also included are a few small areas of the well drained Losantville and Miami soils in the higher landscape positions. Included soils make up about 10 percent of the map unit.

The Patton soil is moderately permeable in the subsoil and moderately slowly permeable in the underlying material. Available water capacity is high. Surface runoff is very slow or ponded. The water table is near or above the surface during winter and early spring. Organic matter content is high in the surface layer. If tilled when too wet, this layer becomes cloddy and hard to work. Under these conditions, seedbed preparation is difficult.

Most areas of this soil are used for cultivated crops. A few are used for hay, pasture, woodland, or specialty crops.

If drained, this soil is well suited to corn, soybeans, and small grain. The ponding is the major hazard. Most areas are drained by subsurface drains, open ditches, or a combination of these. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth. The soil is well suited to fall plowing.

This soil is well suited to grasses, such as reed canarygrass, and legumes, such as ladino clover, for hay or pasture. A drainage system is necessary. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces plant density and plant hardiness. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods minimize surface compaction and help to maintain tilth and plant density.

This soil is suited to trees. The equipment limitation, seedling mortality, windthrow, and plant competition are management concerns. Equipment should be used only during dry periods or when the ground is frozen. Special site preparation, such as bedding, is needed in some areas. Harvest methods that do not isolate the remaining trees or leave them too widely spaced reduce the windthrow hazard. Competing vegetation can be controlled by spraying, cutting, or girdling.

Because of the ponding and the restricted permeability, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of low strength, ponding, and frost action. Providing coarse textured subgrade or base material helps to prevent the damage caused by low strength. Building the roads on raised, well compacted fill material and providing adequate roadside ditches and culverts help to prevent the damage caused by ponding and frost action.

The land capability classification is IIw. The woodland ordination symbol is 5W.

Pw—Pewamo silty clay loam. This nearly level, deep, very poorly drained soil is in broad depressions and small drainageways on till plains and lake plains. It is subject to ponding. Areas are long and irregularly shaped and are 5 to 300 acres in size. The dominant size is about 30 acres.

Typically, the surface layer is very dark gray silty clay loam about 9 inches thick. The subsurface layer is very dark gray silty clay about 9 inches thick. The subsoil is about 32 inches thick. The upper part is dark gray and gray, mottled, firm silty clay, and the lower part is gray, mottled, firm silty clay loam. The underlying material to a depth of 65 inches is light brownish gray, calcareous silty clay loam. In some areas the subsoil has more clay. In other areas it has less clay. In a few places the surface layer is lighter colored.

Included with this soil in mapping are small areas of the moderately well drained Glynwood soils on ridgetops and knolls and the somewhat poorly drained Blount soils on slight rises. Also included are small areas of the well drained, gently sloping Morley soils on side slopes along small drainageways and areas of soils that are underlain by sand and gravel. Included soils make up about 15 percent of the map unit.

The Pewamo soil is moderately slowly permeable. Available water capacity is high. Surface runoff is very slow or ponded. The water table is near or above the surface during winter and early spring. Organic matter content is high in the surface layer. If tilled when too wet, this layer becomes cloddy and hard to work. Under these conditions, seedbed preparation is difficult.

Most areas of this soil are used for cultivated crops. A few are used for hay, pasture, or woodland.

If drained, this soil is well suited to corn, soybeans, and small grain. The ponding is the major hazard (fig. 9). Most areas are drained by subsurface drains, surface drains, open ditches, or a combination of these. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth. The soil is well suited to fall plowing.

This soil is well suited to grasses, such as reed canarygrass, and legumes, such as ladino clover, for hay and pasture. A drainage system is necessary. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces plant density and plant hardiness. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods minimize surface compaction and help to maintain tilth and plant density.

This soil is fairly well suited to trees. The equipment limitation, seedling mortality, windthrow, and plant competition are management concerns. Equipment should be used only during dry periods or when the ground is frozen. Some replanting of seedlings is usually necessary. Special site preparation, such as bedding, is needed in some areas. Harvest methods that do not isolate the remaining trees or leave them too widely

Figure 9.—Soybeans damaged by ponding in an area of Pewamo silty clay loam.

spaced reduce the windthrow hazard. Competing vegetation can be controlled by cutting, spraying, and girdling.

Because of the ponding and the moderately slow permeability, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of low strength, ponding, and frost action. Providing coarse textured subgrade or base material helps to prevent the damage caused by low strength. Building the roads on raised, well compacted fill material and providing adequate roadside ditches and culverts help to prevent the damage caused by ponding and frost action.

The land capability classification is IIw. The woodland ordination symbol is 5W.

Px—Pewamo silt loam, overwash. This nearly level, deep, very poorly drained soil is in slight depressions and small drainageways on till plains. It is subject to ponding. Areas are irregularly shaped or elongated and are 3 to 60 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer is about 11 inches thick. The upper part is grayish brown silt loam, and the lower part is very dark gray silty clay loam. The subsoil is about 32 inches thick. The upper part is dark gray, mottled, firm clay, and the lower part is olive gray, mottled, firm silty clay. The underlying material to a depth of 65 inches is olive gray, calcareous silty clay loam. It has thin strata of sandy loam in the lower part. In some areas the dark surface soil is less than 10 inches thick. In other areas the lower part of the subsoil has less clay. In places the depth to the underlying material is less than 24 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Blount soils on slight rises and the moderately well drained Glynwood soils on ridgetops and knolls. Also included are some small areas of the well drained, gently sloping and moderately sloping Morley soils on side slopes along small drainageways. Included soils make up about 10 percent of the map unit.

The Pewamo soil is moderately slowly permeable. Available water capacity is high. Surface runoff is very slow or ponded. The water table is near or above the surface during winter and early spring. Organic matter content is moderate in the surface layer. If tilled when too wet, this layer becomes cloddy and hard to work. Under these conditions seedbed preparation is difficult.

Most areas of this soil are used for cultivated crops. A few are used for hay and pasture.

If drained, this soil is well suited to corn, soybeans, and small grain. The ponding is the major hazard. Most areas are drained by surface drains, subsurface drains, open ditches, or a combination of these. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to maintain the organic matter content and tilth. The soil is well suited to fall plowing.

This soil is well suited to grasses, such as reed canarygrass, and legumes, such as ladino clover, for hay and pasture. A drainage system is necessary. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces plant density and plant hardiness. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods minimize surface compaction and help to maintain tilth and plant density.

This soil is poorly suited to trees. The equipment limitation, seedling mortality, windthrow, and plant competition are management concerns. Equipment should be used only during dry periods or when the ground is frozen. Special site preparation, such as bedding, is needed in some areas. Harvest methods that do not isolate the remaining trees or leave them too widely spaced reduce the windthrow hazard. Species that can withstand the wetness should be favored in the stands. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation and by cutting, spraying, or girdling.

Because of the ponding and the restricted permeability, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of low strength, ponding, and frost action. Providing coarse textured subgrade or base material helps to prevent the damage caused by low strength. Building the roads on raised, well compacted fill material and providing adequate roadside ditches and culverts help to prevent the damage caused by ponding and frost action.

The land capability classification is IIw. The woodland ordination symbol is 5W.

Sa—Saranac silty clay, frequently flooded. This nearly level, deep, poorly drained soil is in slight depressions on flood plains. Areas are long and irregularly shaped and are 3 to 50 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is very dark grayish brown silty clay about 8 inches thick. The subsurface layer also is very dark grayish brown silty clay. It is about 11 inches thick. The subsoil is about 33 inches thick. The upper part is dark gray, mottled, firm clay, and the lower part is gray, mottled, firm silty clay that has thin strata of fine sand. The substratum to a depth of 60 inches is gray clay loam that has thin strata of fine sand. In some small areas the surface layer is silty clay loam or clay loam. In a few places it is lighter in color.

Included with this soil in mapping are small areas of the well drained Allison Variant soils on slight rises. These soils make up about 8 percent of the map unit.

The Saranac soil is moderately slowly permeable. Available water capacity is high. Surface runoff is very slow or ponded. The water table is at or near the surface during winter and early spring. Organic matter content is high in the surface layer. If tilled when too wet, this layer becomes cloddy and hard to work. Under these conditions, seedbed preparation is difficult.

Most areas of this soil are used for cultivated crops. A few are used for hay, pasture, or woodland.

This soil is fairly well suited to corn, soybeans, and small grain. The frequent flooding is the main hazard, but it normally occurs before the crops are planted. A drainage system has been established in most areas. Additional drainage measures are needed in some areas. These measures include subsurface drains, surface drains, open ditches, or a combination of these. Levees help to control flooding. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to maintain the organic matter content and tilth.

This soil is well suited to grasses, such as reed canarygrass, and legumes, such as birdsfoot trefoil and ladino clover, for hay and pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because the high water table restricts root growth. The flooding and the wetness are management concerns. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A few small areas are wooded. This soil is poorly suited to trees. The equipment limitation, seedling mortality, windthrow, and plant competition are management concerns. Equipment should be used only during dry periods or when the ground is frozen. Special site preparation, such as bedding, is needed in some areas. Harvest methods that do not isolate the remaining trees or leave them too widely spaced reduce the windthrow hazard. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, or girdling.

Because of the flooding, the wetness, and the moderately slow permeability, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of wetness, low strength, and flooding. Providing coarse textured subgrade or base material helps to prevent the damage caused by low strength. Building the roads on raised, well compacted fill material and providing adequate roadside ditches and culverts help to prevent the damage caused by flooding. Levees also help to prevent this damage.

The land capability classification is IIIw. The woodland ordination symbol is 4W.

Sm—Sleeth loam. This nearly level, deep, somewhat poorly drained soil is on broad outwash plains. Areas are elongated or irregularly shaped and are 3 to 25 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is dark grayish brown loam about 9 inches thick. The subsurface layer is grayish brown loam about 3 inches thick. The subsoil is about 38 inches thick. The upper part is dark grayish brown and yellowish brown, mottled, firm clay loam, and the lower part is yellowish brown, mottled, firm loam. The underlying material to a depth of 65 inches is grayish brown, calcareous gravelly loamy fine sand. In some areas the depth to calcareous sand and gravel is more than 50 inches. In a few places the subsoil has more sand and gravel.

Included with this soil in mapping are areas of the well drained Eldean Variant and Fox soils on low knolls, on ridges, and along small drainageways. Also included are some small areas of severely eroded soils and, on the lower parts of the landscape, small areas of undrained soils that stay wet for long periods. Included soils make up about 10 percent of the map unit.

The Sleeth soil is moderately permeable in the subsoil and very rapidly permeable in the underlying material. Available water capacity is high. Surface runoff is slow. The water table is at a depth of 1 to 3 feet during winter and early spring. Organic matter content is moderate in the surface layer. This layer is friable and can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture, and a few are used for orchards or woodland.

This soil is well suited to corn, soybeans, and small grain. The wetness is a limitation. Most areas are drained by surface and subsurface drains. Additional drainage measures are needed in some areas. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to maintain the organic matter content and good tilth.

If drained, this soil is well suited to grasses, such as bromegrass and orchardgrass, and legumes, such as alfalfa and red clover, for hay and pasture. The wetness is a limitation. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation and by cutting, spraying, or girdling. The high water table in the spring can hinder harvesting and planting.

Because of the wetness, this soil is severely limited as a site for dwellings. Subsurface drains can lower the water table. The dwellings should be constructed without basements. The sides of shallow excavations can cave in unless they are reinforced. The soil is severely limited as a site for local roads and streets because of low strength and frost action. The base material should be replaced or covered with material that can support vehicular traffic. Constructing the roads on raised, well compacted fill material and providing adequate roadside ditches and culverts help to prevent the damage caused by frost action.

Because of the wetness and a poor filtering capacity, this soil is severely limited as a site for septic tank absorption fields. It readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. A perimeter drainage system can lower the water table.

The land capability classification is IIw. The woodland ordination symbol is 5A.

So—Sloan silt loam, frequently flooded. This nearly level, deep, very poorly drained soil is on flood plains along the major streams, along narrow streams, and in narrow draws. Areas are long and narrow or irregularly shaped and are 3 to 60 acres in size. The dominant size is about 5 acres.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is very dark grayish brown silty clay loam about 8 inches thick. The subsoil is about 24 inches thick. The upper part is grayish brown, mottled, friable clay loam; the next part is dark gray, mottled, friable loam; and the lower part is grayish brown, mottled, friable clay loam that has thin strata of silty clay loam. The underlying material to a depth of 80 inches is calcareous. The upper part is light brownish gray loam that has thin strata of silt loam and sandy loam, and the lower part is gray very fine sandy loam. In some areas the subsoil is lighter colored and is thicker. In places the soil has more clay in the upper part.

Included with this soil in mapping are areas of the moderately well drained Eel soils in the slightly higher positions on the landscape. Also included are some small areas that are ponded for long periods. Included soils make up about 10 percent of the map unit.

The Sloan soil is moderately permeable or moderately slowly permeable. Available water capacity is high. Surface runoff is very slow or ponded. The water table is at or near the surface during winter and early spring. Organic matter content is high in the surface layer. This layer is friable and can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. A few are used for hay, pasture, or woodland.

This soil is fairly well suited to corn, soybeans, and small grain. The flooding is the main hazard, but it normally occurs before the major crops are planted. Some areas between streams are too narrow for cropping. A drainage system has been established in many areas. Additional drainage measures are needed in some areas. These measures include land smoothing and shallow surface drains. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops increase the organic matter content and help to maintain good tilth.

This soil is well suited to grasses, such as reed canarygrass, and legumes, such as ladino clover, for hay and pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because the high water table restricts root growth. The flooding and the wetness are the main management concerns. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A few areas are wooded. This soil is poorly suited to trees. The equipment limitation, seedling mortality, windthrow, and plant competition are management concerns. Flooding is a hazard. Prolonged seasonal wetness hinders harvesting and planting. Equipment should be used only when the soil is relatively dry or frozen. Because of seedling mortality, the larger, older seedlings should be selected for planting or the plant density should be increased. Harvest methods that do not isolate the remaining trees or leave them too widely spaced reduce the windthrow hazard. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

Because of the flooding and the wetness, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of wetness, low strength, and flooding. Providing coarse textured subgrade or base material helps to prevent the damage caused by low strength. Building the roads on raised, well compacted fill material and providing adequate roadside ditches and culverts help to prevent the damage caused by flooding and wetness. Levees help to control flooding.

The land capability classification is IIIw. The woodland ordination symbol is 4W.

Tr—Treaty silt loam. This nearly level, deep, very poorly drained soil is in slight depressions on broad till plains. It is subject to ponding. Areas are irregular in shape and are 3 to 400 acres in size. The dominant size is about 25 acres.

Typically, the surface layer is black silt loam about 7 inches thick. The subsurface layer is black silty clay loam about 4 inches thick. The subsoil is about 34 inches thick. The upper part is dark gray and gray, mottled, firm silty clay loam, and the lower part is grayish brown, mottled, firm silt loam. The underlying material to a depth of 60 inches is yellowish brown, mottled loam. In places the soil has more sand in the lower part. In some areas the loess is less than 24 inches thick. In a few places lighter colored material overlies the original black surface layer.

Included with this soil in mapping are many small areas of the moderately well drained Celina soils on small knolls and ridgetops and slightly convex areas of the somewhat poorly drained Crosby and Fincastle soils. Also included are a few areas of the well drained Miami soils along small drainageways and on the higher knobs. Included soils make up about 15 percent of the map unit.

The Treaty soil is moderately permeable in the subsoil and moderately slowly permeable in the underlying material. Available water capacity is high. Surface runoff is very slow or ponded. The water table is near or above the surface during winter and early spring. Organic matter content is high in the surface layer. If tilled when too wet, this layer becomes cloddy and hard to work. Under these conditions, seedbed preparation is difficult.

Most areas of this soil are used for cultivated crops. A few are used for hay, pasture, woodland, or specialty crops.

If drained, this soil is well suited to corn, soybeans, and small grain. The ponding is the main hazard. Most areas are drained by surface drains, subsurface drains, open ditches, or a combination of these. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops increase the organic matter content and help to maintain tilth. The soil is well suited to fall plowing.

This soil is well suited to grasses, such as reed canarygrass, and legumes, such as ladino clover, for hay or pasture. It is poorly suited to deep-rooted legumes. The ponding is a hazard. A drainage system is necessary. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces plant density and plant hardiness. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods minimize surface compaction and help to maintain tilth and plant density.

This soil is poorly suited to trees. The equipment limitation, seedling mortality, windthrow, and plant competition are management concerns. Equipment should be used only during dry periods or when the ground is frozen. Special site preparation, such as bedding, is needed in some areas. Harvest methods that do not isolate the remaining trees or leave them too widely spaced reduce the windthrow hazard. Some replanting of seedlings is usually necessary. Competing vegetation can be controlled by proper site preparation and by cutting, spraying, or girdling.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of low strength, ponding, and frost action. Providing coarse textured subgrade or base material helps to prevent the damage caused by low strength. Constructing the roads on raised, well compacted fill material and providing adequate roadside ditches and culverts help to prevent the damage caused by ponding and frost action.

The land capability classification is IIw. The woodland ordination symbol is 5W.

Ts—Treaty silt loam, stony subsoil. This nearly level, deep, very poorly drained soil is in slight depressions on broad till plains and moraines. It is subject to ponding. Areas are irregular in shape and are 3 to 350 acres in size. The dominant size is about 20 acres.

Typically, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsurface layer also is very dark grayish brown silt loam. It is about 7 inches thick. The subsoil is gray, mottled, firm silty clay loam about 30 inches thick. It has stones more than 12 inches in diameter. The underlying material to a depth of 60 inches is light olive brown, calcareous loam. In some areas the soil has more sand in the lower part. In other areas the loess cap is less than 24 inches thick.

Included with this soil in mapping are many small areas of the somewhat poorly drained Crosby soils on slight rises and a few areas of the well drained Losantville soils along small drainageways and on the higher knobs. Losantville soils dry out more quickly in the spring than the Treaty soil. Also included are some small wet areas. Included soils make up about 12 percent of the map unit.

The Treaty soil is moderately permeable in the subsoil and moderately slowly permeable in the underlying material. Available water capacity is very high. Surface runoff is very slow or ponded. The water table is near or above the surface during winter and early spring. Organic matter content is high in the surface layer. If tilled when too wet, this layer becomes cloddy and hard to work. Under these conditions, seedbed preparation is difficult. In some areas coarse fragments on or near the surface can hinder tillage.

Most areas of this soil are used for cultivated crops. Many are used for pasture or woodland.

If drained, this soil is well suited to corn, soybeans, and small grain. The ponding is a hazard. Most areas are drained by surface drains, subsurface drains, open ditches, or a combination of these. Unless they are removed, the coarse fragments can cause problems when the soil is tilled. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops increase the organic matter content and help to maintain tilth. The soil is well suited to fall plowing.

This soil is well suited to grasses, such as reed canarygrass, and legumes, such as ladino clover, for hay or pasture. It is poorly suited to deep-rooted legumes. The ponding is a hazard. A drainage system is necessary. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Overgrazing also reduces plant density and plant hardiness. Unless they are removed, the coarse fragments on and below the surface can hinder haying. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods minimize surface compaction and help to maintain tilth and plant density.

Many areas are wooded. This soil is poorly suited to trees. The equipment limitation, seedling mortality, windthrow, and plant competition are management concerns. Equipment should be used only during dry periods or when the ground is frozen. Special site preparation, such as bedding, is needed in some areas. Harvest methods that do not isolate the remaining trees or leave them too widely spaced reduce the windthrow hazard. Some replanting of seedlings is usually necessary. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation and by cutting, spraying, or girdling.

Because of the ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of low strength, ponding, and frost action. Providing coarse textured subgrade or base material helps to prevent the damage caused by low strength. Constructing the roads on raised, well compacted fill material and providing adequate roadside ditches and culverts help to prevent the damage caused by ponding and frost action.

The land capability classification is IIw. The woodland ordination symbol is 5W.

Ud—Udorthents, loamy. These nearly level to very steep, shallow to deep, well drained to somewhat poorly drained soils are in disturbed areas on till plains, outwash plains, lake plains, and flood plains. They are around gravel pits, limestone quarries, highway interchanges, landfills, shopping centers, and factories.

In places, deep cuts have been made in the original land surface and the soil material has been removed. This borrow material has been used as fill in lower lying areas, where it provides a smoother, more nearly level surface. In some areas the borrow material has been used as fill on sites for highway grades, overpasses, and highway ramps. Many borrow areas are filled with water and are used for various types of wildlife habitat. Areas are circular, oval, or irregularly shaped and are 3 to 25 acres in size. The dominant size is about 10 acres.

Typically, the fill and pit areas consist of a mixture of surface soil, subsoil, and underlying material from the original soil. The texture is silt loam, loam, clay loam, silty clay loam, silty clay, and clay. In some areas the soil material has some gravel, sand, or stones. In areas where a deep cut has been made, the material is mainly loam, clay loam, or silty clay loam glacial till or is gravelly sand.

Included with these soils in mapping are small areas where slopes are short and steep; areas of sand, gravel, and stones; areas where bedrock is exposed; and a few fill areas underlain by muck. Also included are fill areas of rock, glass, metal, and other material.

The Udorthents are moderately slowly permeable. Available water capacity is moderate. Surface runoff is very rapid to slow. Organic matter content is low in the surface layer. Reaction is medium acid to strongly alkaline.

Most areas of these soils support a permanent cover of grasses and low-growing shrubs. Accessibility is limited. Many areas are surrounded by heavily traveled highways. Some are used as wildlife habitat.

Special management practices are needed in the areas of pits. An intensive fertilization program with special emphasis on use of organic matter residue or manure is needed if these areas are used for crops. Measures that control erosion are needed in the gently sloping to very steep areas. Examples are diversions, box inlet structures, grade stabilization structures, and grassed waterways. Exposed areas should be revegetated as soon as possible after construction. A drainage system is needed in some nearly level areas.

If these soils are used as sites for dwellings, onsite investigation is needed to determine the soil properties and limitations. Engineering tests are needed because the soil properties that affect the design of structures vary from one location to another. The limitations include wetness and restricted permeability in the nearly level areas and slope and restricted permeability in the gently sloping to very steep areas. Frost action may be a limitation on sites for local roads. Because of the erosion hazard, as little vegetation as possible should be removed from building sites and a protective plant cover should be established as soon as possible.

No land capability classification or woodland ordination symbol has been assigned.

Wa—Wallkill silt loam, undrained. This nearly level, deep, very poorly drained soil is in deep depressions and potholes on till plains. It is subject to ponding. Areas are irregularly shaped or oval and are 3 to 20 acres in size. The dominant size is about 5 acres.

Typically, the surface layer is dark grayish brown silt loam about 5 inches thick. The next 13 inches is olive gray silty clay loam. Below this is a buried soil. The buried surface layer is black mucky silt loam about 16 inches thick. The buried subsoil is black and dark reddish brown muck about 13 inches thick. The underlying material to a depth of 65 inches is olive gray, calcareous marl. In a few areas the surface soil and subsoil have more clay.

Included with this soil in mapping are many small areas of the very poorly drained Carlisle and Linwood soils, which have an organic surface soil. Also included are small areas of Patton and Pewamo soils in the slightly higher positions on the landscape. These soils do not have organic layers. Included soils make up about 15 percent of the map unit.

The Wallkill soil is moderately permeable in the mineral layers and moderately rapidly permeable or rapidly permeable in the organic layers. Available water capacity is very high. Surface runoff is very slow or ponded. The water table is near or above the surface during winter and spring. In a few areas it is a few inches below the surface for short periods late in summer. Organic matter content is moderate or high in the surface layer.

This soil supports cattails, reeds, sedges, marsh grasses, buttonbush, redosier dogwood, willows, and soft maple or other water-tolerant trees or shrubs. It is generally unsuited to cultivated crops and to hay and is poorly suited to pasture. It is well suited to wetland wildlife habitat. The natural vegetation provides good habitat for wetland wildlife. It furnishes abundant protective cover and a sufficient amount of available food, mainly from seed-bearing shrubs.

Some small areas are pastured or wooded. This soil is poorly suited to woodland. The main management concerns are the equipment limitation, seedling mortality, and windthrow. Equipment should be used only when the soil is relatively dry or frozen. Because of seedling mortality, the larger, older seedlings should be selected for planting or the plant density should be increased. Harvest methods that do not isolate the remaining trees or leave them too widely spaced reduce the windthrow hazard.

Because of ponding and low strength, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of ponding and frost action. Overcoming these limitations is very difficult. The base material should be replaced with material that can support vehicular traffic. Constructing the roads on raised, well compacted fill material and providing adequate roadside ditches and culverts help to prevent the damage caused by ponding and frost action.

The land capability classification is Vw. The woodland ordination symbol is 3W.

Wo—Westland clay loam, limestone substratum. This nearly level, deep, very poorly drained soil is in slight depressions on outwash plains. It is subject to ponding. Areas are long and narrow or irregularly shaped and are 3 to 25 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is very dark gray clay loam about 9 inches thick. The subsurface layer also is very dark gray clay loam. It is about 5 inches thick. The subsoil is dark gray, mottled, firm clay loam about 13 inches thick. The underlying material is about 18 inches thick. It is calcareous. The upper part is mottled yellowish brown and brownish yellow very channery loam, and the lower part is light yellowish brown extremely flaggy loam. Hard limestone bedrock is at a depth of about 45 inches. In some areas the subsoil has more clay.

Included with this soil in mapping are many small areas of the well drained Eldean Variant and Fox soils on slight rises. Also included, in depressions, are small areas of soils that have a mucky surface layer. Included soils make up about 12 percent of the map unit.

The Westland soil is moderately permeable. Available water capacity is moderate. Surface runoff is very slow or ponded. The water table is near or above the surface during winter and early spring. Organic matter content is high in the surface layer. If tilled when too wet, this layer becomes cloddy and hard to work. Under these conditions, seedbed preparation is difficult.

Most areas of this soil are used for cultivated crops. A few are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. The ponding is the major hazard. A drainage system has been established in most areas. Additional drainage measures are needed in many areas. These measures include land smoothing and shallow surface drains. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops increase the organic matter content and help to maintain tilth. The soil is well suited to fall plowing.

This soil is well suited to grasses, such as reed canarygrass, and legumes, such as ladino clover, for hay and pasture. The ponding is a hazard. A drainage system is necessary. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Overgrazing also reduces plant density and plant hardiness. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods minimize surface compaction and help to maintain tilth and plant density.

This soil is poorly suited to trees. The equipment limitation, seedling mortality, windthrow, and plant competition are management concerns. The prolonged seasonal wetness hinders harvesting and planting. Special site preparation, such as bedding, is needed in some areas. Harvest methods that do not isolate the remaining trees or leave them too widely spaced reduce the windthrow hazard. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation and by cutting, spraying, or girdling.

Because of ponding, this soil is generally unsuitable as a site for dwellings and sanitary facilities. It is severely limited as a site for local roads because of low strength, ponding, and frost action. Providing coarse textured subgrade or base material helps to prevent the damage caused by low strength. Constructing the roads on raised, well compacted fill material and providing adequate roadside ditches and culverts help to prevent the damage caused by ponding and frost action.

The land capability classification is IIw. The woodland ordination symbol is 2W.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban and built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

About 255,000 acres in the survey area, or more than 87 percent of the total acreage, meets the soil requirements for prime farmland. Scattered areas of this land are throughout the county. About 147,014 acres of this prime farmland is used for crops.

A recent trend in land use in some areas near Union City and Winchester has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table and all soils that are frequently flooded during the growing season qualify for prime farmland only in areas where these limitations have been overcome by such drainage measures or flood control. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Harry Pearce, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

More than 228,480 acres in the county was used for crops and pasture in 1982 (*7*). About 78,438 acres was used for corn, 94,704 acres for soybeans, 27,954 acres for wheat and oats, and 13,785 acres for hay. About 8,060 acres was used only as pasture, and 5,539 acres was other cropland. The acreage used for crops and pasture has been very slowly decreasing as a few areas have been developed for urban uses. In 1967, an estimated 21,100 acres of the county was urban and built-up land. This figure has increased at the rate of about 1,050 acres per year.

The potential of the soils in Randolph County for increased production of food is good. Applying the latest crop production technology to all of the cropland in the county would increase food production significantly. This soil survey can greatly facilitate the application of such technology. The paragraphs that follow describe the major concerns in managing the soils in the county for crops and pasture. These concerns are drainage, water erosion, fertility, and tilth.

Soil drainage is the major problem on about 60 percent of the cropland and pasture in the county. Most areas of the very poorly drained Sloan, Pewamo, Treaty, and Westland soils and the poorly drained Patton and Saranac soils are adequately drained. A few areas of the very poorly drained soils in depressions, however, cannot be economically drained. Drainage ditches would have to be deep and would have to extend for a great distance to a suitable outlet. As a result, very few areas of Carlisle, Linwood, and Wallkill soils are adequately drained.

Unless drained, the somewhat poorly drained Blount, Crosby, Fincastle, and Sleeth soils are so wet that crops are damaged in most years. These soils make up about 46,665 acres in the county.

Allison Variant, Eldean Variant, Fox, Losantville, Miami, and Morley soils are naturally well drained, but they tend to dry out slowly after rains. Small areas of wetter soils along drainageways and in swales are commonly included with these soils in mapping, especially where the slope is 2 to 6 percent. A drainage system is needed in some of these included areas.

The design of surface and subsurface drainage systems depends on the kind of soil. A combination of surface and subsurface drains is needed in most areas of the poorly drained and very poorly drained soils that are intensively row cropped. The drains should be more closely spaced in slowly permeable soils than in the more rapidly permeable soils. Locating adequate outlets for tile drainage is difficult in many areas of Carlisle, Linwood, Patton, Pewamo, Treaty, Wallkill, and Westland soils.

Organic soils oxidize and subside when their pore space is filled with air. Therefore, special drainage systems are needed to control the depth and the period of drainage. Keeping the water table at the level required by the crops during the growing season and raising it to the surface during the rest of the year minimize oxidation and subsidence of organic soils.

Information about the design of drainage systems for each kind of soil is given in the Technical Guide, available in local offices of the Soil Conservation Service.

Water erosion is the major management concern on about 20 percent of the cropland and pasture in the county. It is a hazard in areas where the slope is more than 2 percent. It is damaging because it reduces productivity and results in sedimentation in streams.

Productivity is reduced as the surface layer is lost through erosion and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, such as Blount, Celina, Glynwood, Losantville, Morley, and Pewamo soils, and on soils that have a restricted root zone, such as Westland clay loam, limestone substratum. Erosion also reduces the productivity of soils that tend to be droughty, such as Fox and Eldean Variant soils.

On many of the more sloping soils, preparing a good seedbed and tilling are difficult because the original friable surface layer has been eroded away. Poor tilth is common in areas of the severely eroded Losantville and Morley soils.

Erosion-control measures provide a protective cover, reduce the runoff rate, and increase the rate of water infiltration. A cropping system that keeps a cover of crop residue and plants on the soil during rainy periods can hold soil losses to an amount that does not reduce the productive capacity of the soils.

On livestock farms, where pasture and hay are needed, including forage crops of grasses and legumes in the cropping sequence reduces the susceptibility of the more sloping soils to erosion and provides nitrogen and improves tilth for the following crop. Well drained soils, such as Eldean Variant, Fox, Losantville, Miami, and Morley soils, are well suited to bromegrass, orchardgrass, and timothy mixed with alfalfa or red clover. Poorly drained or very poorly drained soils, such as Patton, Pewamo, Treaty, and Westland soils, are well suited to reed canarygrass mixed with ladino clover.

A system of conservation tillage that leaves crop residue on the surface increases the rate of water infiltration and reduces the runoff rate and the hazard of erosion. Most of the soils in the county are suitable for conservation tillage. An increasing acreage is used for corn and soybeans grown under a system of no-till or ridge-till farming. No-till farming is suitable on most of the cropland in the county. Because they warm up more quickly in the spring, the well drained soils are better suited to no-till farming than the wetter soils.

Terraces and water- and sediment-control basins shorten the length of the slopes and thus are effective in reducing the susceptibility to sheet, rill, and gully erosion. These measures are most practical on deep, well drained soils that have a slope of less than 12 percent. Examples are Miami and Morley soils and the less sloping Losantville soils. Soils that are strongly sloping or that have bedrock within a depth of 40 inches are less well suited to terraces and diversions than other soils.

Contour farming and contour stripcropping are effective in controlling erosion on the soils in the county, especially on soils that have smooth, uniform slopes, such as Losantville and Morley soils. Grassed waterways help to control erosion throughout the county. They are best suited to deep, well drained soils, such as Losantville, Miami, and Morley soils. Grassed waterways are needed in many areas where a large watershed drains across Blount, Celina, Crosby, Glynwood, Patton, Pewamo, and Treaty soils. A subsurface drainage system is generally needed beneath the waterways established on these soils.

Many grade stabilization structures are needed in the county because of the large number of open ditches. These structures help to control erosion in areas where runoff drains into an open ditch. Also, they are commonly needed in open ditches where an excessive gradient results in erosion of the sides and bottom of the ditches.

Soil fertility is naturally low or medium in most of the soils on uplands and terraces in the county. All of these soils, except for Carlisle soils, are slightly acid or neutral. Allison Variant, Eel, Saranac, and Sloan soils, which are on flood plains, are neutral or mildly alkaline. They are naturally higher in content of plant nutrients than most of the soils on uplands and terraces.

On some acid soils applications of ground limestone are needed to raise the pH level sufficiently for good production of alfalfa and other crops that grow well only on nearly neutral soils. Available phosphorus and potassium levels are naturally low in most areas of these soils. On all soils additions of lime and fertilizer should be based on the results of soil tests, the need of the crop, and the expected level of yields. The Cooperative

Extension Service can help in determining the kinds and amounts of fertilizer and lime needed.

Soil tilth is an important factor affecting the germination of seeds and the infiltration of water into the soil. Soils with good tilth are granular and porous.

Most of the soils used for crops in the county have a surface layer of silt loam that is light in color and is low or moderate in content of organic matter. Generally, the structure of these soils is weak, and a crust forms on the surface during periods of heavy rainfall. The crust becomes hard and impervious to water when it dries. As a result, it reduces the rate of water infiltration and increases the runoff rate. Regular additions of crop residue, manure, and other organic material can improve soil structure and minimize crusting.

Conservation tillage is needed on the light colored soils that have a silt loam surface layer. If these soils are plowed in the fall, a crust forms in winter and spring. About 35 percent of the cropland in the county consists of the more sloping soils that are subject to damaging erosion if they are plowed in the fall.

The dark Pewamo, Treaty, and Saranac soils often stay wet until late in spring. If these soils are plowed when wet, they tend to be very cloddy when dry. As a result of the cloddiness, preparing a good seedbed is difficult. Fall plowing generally results in good tilth in the spring.

Field crops that are suited to the soils and climate in the county include many that are not commonly grown. Corn and soybeans are the main row crops. Wheat and oats are the main small grain crops. Rye and barley could be grown, and grass seed can be produced from bromegrass, orchardgrass, fescue, redtop, and bluegrass.

Specialty crops are of limited commercial importance in the county. Only a small acreage is used for vegetables and small fruit crops. Deep, well drained soils that warm up early in spring are especially well suited to many vegetables and small fruits. Examples are Eldean Variant soils and the Fox soils that have a slope of less than 6 percent. If these soils were used for specialty crops, irrigation would be needed. Crops can generally be planted and harvested earlier on these soils than on the other soils in the county. If drained, the organic Carlisle and Linwood are well suited to a wide variety of vegetable crops.

Most of the well drained soils in the county are suitable for orchards and nursery plants. Most of the soils in low landscape positions, where frost is frequent and air drainage is poor, are poorly suited to early vegetables, small fruits, and orchards.

The latest information about growing specialty crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

Michael D. Warner, forester, Soil Conservation Service, helped prepare this section.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; and *F*, a high content of rock fragments in the soil. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, and F.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, fire lanes, and log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment or season of use is not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced on a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It is the dominant species on the soil and the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

James D. McCall, biologist, Soil Conservation Service, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, soybeans, wheat, sorghum, oats, and sunflowers.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are orchardgrass, redtop, bromegrass, bluegrass, clover, timothy, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, ragweed, pokeweed, sheep sorrel, dock, crabgrass, and dandelion.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, wild cherry, sweetgum, apple, willow, hawthorn, maple, beech, dogwood, black walnut, hickory, blackberry, hazelnut, and elderberry.

Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are autumn-olive, Roselow sargent crabapple, and shrub dogwood.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are cattail, smartweed, spikerush, waterplantain, arrowhead, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, dove, killdeer, meadowlark, field sparrow, cottontail, red fox, and woodchuck.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, rails, kingfishers, muskrat, mink, and beaver.

Edge habitat consists of areas where major land uses or cover types adjoin. A good example is the border between dense woodland and a field of no-till corn. Although not rated in the table, edge habitat is of primary importance to animals from the smallest songbirds to white-tailed deer. Most of the animals that inhabit openland or woodland also frequent edge habitat, and desirable edge areas are consistently used by 10 times as many wildlife as are the centers of large areas of woodland or cropland.

Engineering

Max L. Evans, state conservation engineer, Soil Conservation Service, helped prepare this section.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

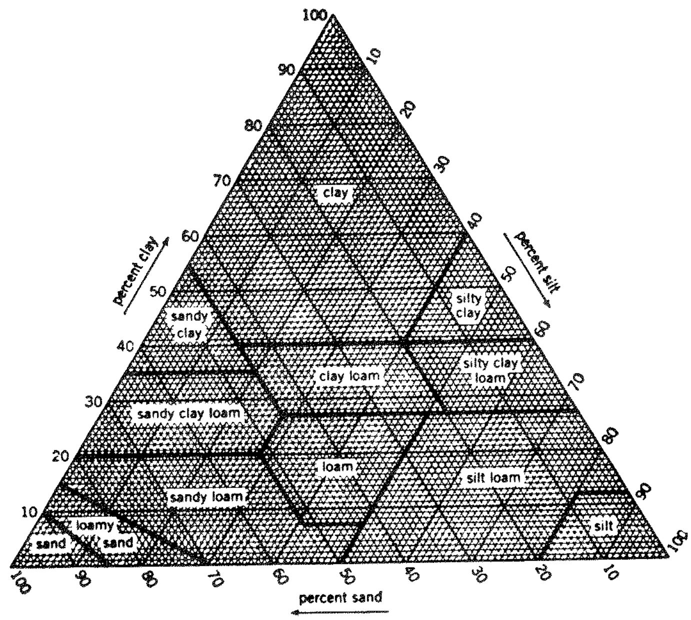


Figure 10.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 10). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection. If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.
5. Loamy soils that are less than 20 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.
6. Loamy soils that are 20 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.
7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.
8. Stony or gravelly soils and other soils not subject to soil blowing.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 18, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*5*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*4*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*5*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Allison Variant

The Allison Variant consists of deep, well drained, moderately slowly permeable soils on flood plains. These soils formed in clayey and silty alluvial deposits. Slopes range from 0 to 2 percent.

Allison Variant soils are commonly near Eel and Saranac soils. Eel soils are more loamy throughout than the Allison Variant soils. They are in landscape positions similar to those of the Allison Variant soils. Saranac soils are grayish throughout. They are in the lower landscape positions.

Typical pedon of Allison Variant silty clay, frequently flooded, in a cultivated field; 400 feet west and 350 feet north of the southeast corner of sec. 7, T. 21 N., R. 13 E.

Ap—0 to 4 inches; very dark grayish brown (10YR 3/2) silty clay, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; many fine roots; few fine pores; neutral; abrupt smooth boundary.

A1—4 to 12 inches; dark brown (10YR 3/3) silty clay, dark brown (10YR 4/3) dry; weak coarse subangular blocky structure; friable; many fine roots; many fine pores; thick continuous brown (10YR 4/3) silt coatings on faces of peds; neutral; clear wavy boundary.

A2—12 to 18 inches; dark brown (10YR 3/3) silty clay, brown (10YR 4/3) dry; weak fine subangular blocky structure; firm; common fine roots; many fine pores; thick continuous very dark grayish brown (10YR 3/2) silt coatings on faces of peds; neutral; clear wavy boundary.

Bw1—18 to 30 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 4/3) dry; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; few medium and common fine pores; thick continuous dark brown (10YR 4/3) silt coatings on faces of peds; neutral; clear wavy boundary.

Bw2—30 to 42 inches; dark brown (10YR 3/3) silty clay loam that has thin strata of silt loam; brown (10YR 4/3) dry; strong medium prismatic structure parting to strong medium subangular blocky; firm; many fine pores; thin discontinuous brown (10YR 4/3) silt coatings on faces of peds; neutral; clear wavy boundary.

C—42 to 60 inches; yellowish brown (10YR 5/6) clay loam that has thin strata of silt loam and sandy loam; massive; firm; neutral.

The solum ranges from 36 to 50 inches in thickness. The A horizon has hue of 10YR and value and chroma of 2 or 3. The upper part of the Bw horizon has hue of 10YR or 7.5YR and value and chroma of 3. The lower part has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 or 4. It is silty clay loam that has some thin strata of silt loam. The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is clay loam that has thin strata of silt loam, silty clay loam, loam, or sandy loam.

Blount Series

The Blount series consists of deep, somewhat poorly drained, slowly permeable soils on till plains and moraines. These soils formed in silty or loamy glacial till. Slopes are 0 to 1 percent.

Blount soils are similar to Crosby soils and are near Glynwood and Pewamo soils in many areas. Crosby soils have less clay in the lower part of the subsoil and in the underlying material than the Blount soils. Glynwood soils are less gray in the upper part of the subsoil than the Blount soils. They are on knolls and ridgetops. Pewamo soils are grayer throughout than the Blount soils. They are in small drainageways and depressional areas.

Typical pedon of Blount silt loam, 0 to 1 percent slopes, in a pasture; 200 feet east and 2,300 feet south of the northwest corner of sec. 14, T. 20 N., R. 12 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; many fine roots; many fine pores; neutral; abrupt smooth boundary.

EB—9 to 12 inches; grayish brown (10YR 5/2) silt loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; many fine roots; many fine and medium pores; thin discontinuous light brownish gray (10YR 6/2) clay films on faces of peds; light gray (10YR 7/2) silt coatings on faces of peds; neutral; clear smooth boundary.

Bt1—12 to 20 inches; brown (10YR 5/3) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; many fine and medium pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—20 to 27 inches; dark grayish brown (10YR 4/2) silty clay; common fine distinct yellowish brown (10YR 5/6) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; many fine and medium pores; thick continuous very dark grayish brown (10YR 3/2) clay films on faces of peds; neutral; clear wavy boundary.

BC—27 to 31 inches; grayish brown (10YR 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles; weak fine and medium prismatic structure parting to weak medium subangular blocky; firm; few fine roots; many fine and medium pores; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; slight effervescence; moderately alkaline; clear wavy boundary.

C—31 to 60 inches; brown (10YR 5/3) silty clay loam; common coarse distinct yellowish brown (10YR 5/6) mottles; massive; very firm; light gray (10YR 7/2) silt coatings on faces of peds; strong effervescence; moderately alkaline.

The solum is 22 to 42 inches thick. The Ap horizon has hue of 10YR, value of 4, and chroma of 1 or 2. Pedons in undisturbed areas have an A horizon. This horizon has hue of 10YR, value of 3, and chroma of 1 or

2. It is 2 to 5 inches thick. The Ap or A horizon is dominantly silt loam but in some pedons is silty clay loam. It is slightly acid or neutral. Some pedons have an E horizon. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6. It ranges from silty clay loam to clay. It is strongly acid to neutral in the upper part and neutral or mildly alkaline in the lower part. The C horizon is clay loam or silty clay loam.

Carlisle Series

The Carlisle series consists of deep, very poorly drained soils in deep depressions on uplands and stream terraces. These soils formed in organic material more than 65 inches thick. They are moderately slowly permeable to moderately rapidly permeable. Slopes range from 0 to 2 percent.

Carlisle soils are commonly near Linwood, Patton, Pewamo, Treaty, and Wallkill soils. Linwood soils have mineral material at a depth of 16 to 51 inches. Their positions in the landscape are similar to those of the Carlisle soils. Patton, Pewamo, and Treaty soils have a mineral solum. They are in positions in the depressions similar to or higher than those of the Carlisle soils. Wallkill soils have 16 to 40 inches of mineral material over the organic material. Their positions on the landscape are similar to those of the Carlisle soils.

Typical pedon of Carlisle muck, undrained, in a cultivated field; 540 feet south and 160 feet west of the northeast corner of sec. 17, T. 19 N., R. 15 E.

Oap—0 to 11 inches; sapric material, black (N 2/0) broken face and rubbed; weak fine granular structure; friable; common fine roots; medium acid; clear smooth boundary.

Oa1—11 to 17 inches; sapric material, black (10YR 2/1) broken face and rubbed; about 5 percent fiber, a trace rubbed; weak medium subangular blocky structure; friable; few fine roots; medium acid; clear smooth boundary.

Oa2—17 to 28 inches; sapric material, dark brown (7.5YR 4/4) broken face, dark reddish brown (5YR 3/2) rubbed; about 40 percent fiber, 15 percent rubbed; massive; friable; many woody fragments 0.25 inch to 6.0 inches in diameter; slightly acid; clear smooth boundary.

Oa3—28 to 40 inches; sapric material, dark brown (7.5YR 4/4) broken face, dark reddish brown (5YR 3/2) rubbed; about 45 percent fiber, 15 percent rubbed; massive; friable; few woody fragments 0.25 inch to 3.0 inches in diameter; neutral; clear smooth boundary.

Oa4—40 to 60 inches; sapric material, dark reddish brown (5YR 3/2 or 3/3) broken face and rubbed; about 30 percent fiber, 5 percent rubbed; massive; friable; neutral.

The organic material is more than 51 inches thick. It is medium acid to neutral. The surface tier is black (10YR 2/1 or N 2/0). It is dominantly sapric material, but is 25 to 40 percent hemic and fibric material. The subsurface tiers have hue of 10YR, 7.5YR, or 5YR, value of 2 to 4, and chroma of 1 to 4. The bottom tier is mixed sapric, hemic and fibric material in some pedons.

Celina Series

The Celina series consists of deep, moderately well drained, moderately slowly permeable soils on till plains and moraines. These soils formed in a thin mantle of loess and in the underlying glacial till. Slopes range from 1 to 4 percent.

The Celina soils in Randolph County are taxadjuncts to the series because they typically change abruptly in texture between the E horizon and the 2Bt1 horizon. This difference, however, does not affect the usefulness or behavior of the soils.

Celina soils are commonly near Crosby, Losantville, and Treaty soils. Crosby soils have grayish brown mottles in the upper part of the subsoil. They are in the slightly lower landscape positions. Losantville soils are browner throughout than the Celina soils. They are on the higher slopes. Treaty soils are grayer throughout than the Celina soils. They are on the lower lying flats.

Typical pedon of Celina silt loam, 1 to 4 percent slopes, in a cultivated field; 300 feet west and 1,400 feet south of the northeast corner of sec. 36, T. 20 N., R. 13 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate coarse granular structure; friable; common fine roots; many medium and few fine pores; neutral; abrupt smooth boundary.

E—8 to 17 inches; brown (10YR 5/3) silt loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common fine roots; many medium and few fine pores; light gray (10YR 7/2) silt coatings on faces of peds; neutral; clear smooth boundary.

2Bt1—17 to 23 inches; brown (10YR 4/3) silty clay; common medium distinct yellowish brown (10YR 5/6) and common medium faint grayish brown (10YR 5/2) mottles; moderate coarse angular blocky structure; firm; common fine roots; many medium and few fine pores; thick continuous brown (10YR 4/3) clay films on faces of peds; neutral; clear wavy boundary.

2Bt2—23 to 32 inches; yellowish brown (10YR 5/4) clay; common coarse faint light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; thick continuous brown (10YR 4/3) clay films on faces of peds; very dark gray (10YR 3/1) organic stains; neutral; clear wavy boundary.

2C1—32 to 48 inches; yellowish brown (10YR 5/4) loam; many medium faint yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; massive; firm; few fine roots; thin discontinuous brown (10YR 4/3) silt coatings on faces of peds; slight effervescence; mildly alkaline; gradual wavy boundary.

2C2—48 to 60 inches; yellowish brown (10YR 5/4) loam; common fine faint yellowish brown (10YR 5/6) mottles; massive; very firm; strong effervescence; moderately alkaline.

The solum is 30 to 40 inches thick. The loess mantle is 8 to 17 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam or loam. It is slightly acid or neutral. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is clay loam, silty clay, or clay. It is medium acid to neutral. Some pedons have a BC horizon, which is slightly acid to mildly alkaline. The C horizon has hue of 10YR, value of 5, and chroma of 3 or 4.

Crosby Series

The Crosby series consists of deep, somewhat poorly drained, slowly permeable soils on till plains and moraines. These soils formed in a thin mantle of loess and in the underlying loamy glacial till. Slopes range from 0 to 3 percent.

Crosby soils are similar to Blount soils and are commonly near Celina, Fincastle, and Treaty soils. Blount soils have less sand and gravel in the solum than the Crosby soils. Celina soils are in the higher landscape positions. They are browner throughout the subsoil than the Crosby soils. Fincastle soils are on broad flats. They have a mantle of loess that is thicker than that of the Crosby soils. The nearly level Treaty soils are in small drainageways and broad depressions. They are grayer throughout the solum than the Crosby soils.

Typical pedon of Crosby silt loam, in a cultivated area of Fincastle-Crosby silt loams, 0 to 1 percent slopes; 800 feet west and 2,500 feet south of the northeast corner of sec. 18, T. 20 N., R. 15 E.

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; common fine roots; about 1 percent fine gravel; medium acid; abrupt smooth boundary.

Bt1—11 to 14 inches; yellowish brown (10YR 5/4) clay loam; common medium faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; thick discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt2—14 to 19 inches; dark yellowish brown (10YR 4/4) clay; many medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; common fine roots; thick continuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 2 percent fine gravel; neutral; clear wavy boundary.

BC—19 to 22 inches; yellowish brown (10YR 5/4) clay loam; common medium faint yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; firm; few fine roots; thick discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 14 percent fine gravel; slight effervescence; mildly alkaline; clear wavy boundary.

C—22 to 60 inches; light yellowish brown (10YR 6/4) loam; common medium distinct yellowish brown (10YR 5/6) and common medium faint light brownish gray (10YR 6/2) mottles; massive; firm; light gray (10YR 7/1) silt coatings on faces of peds; very dark gray (10YR 3/1) organic coatings on faces of peds; about 5 percent fine gravel; slight effervescence; mildly alkaline.

The thickness of the solum typically is 24 to 30 inches but ranges from 20 to 40 inches. The loess is 8 to 12 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. It is silt loam or loam and is medium acid to neutral. Pedons in wooded areas have an A horizon, which is commonly dark grayish brown (10YR 3/2). Some pedons have an E horizon. This horizon has hue of 10YR, value of 4 or 5, and chroma of 2. It is silt loam or silty clay loam. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6. It ranges from clay loam to silty clay. It is strongly acid to neutral in the upper part and slightly acid or neutral in the lower part. The BC horizon is clay loam or gravelly clay loam. It is neutral to moderately alkaline. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. It is loam or clay loam.

Eel Series

The Eel series consists of deep, moderately well drained, moderately permeable soils on flood plains. These soils formed in silty and loamy alluvium. Slope ranges from 0 to 2 percent.

Eel soils are near Allison Variant and Sloan soils. Allison Variant soils have more clay in the subsoil and in the underlying material than the Eel soils and have a dark surface layer and subsoil. They are on the slightly higher rises and knolls. Sloan soils are grayer throughout the solum than the Eel soils and have a dark surface layer. They are in the lower areas on flats and in swales.

Typical pedon of Eel silt loam, frequently flooded, in a cultivated field; 220 feet south and 540 feet west of the northeast corner of sec. 15, T. 21 N., R. 13 E.

Ap1—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; few fine roots; few fine pores; neutral; clear smooth boundary.

Ap2—6 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium subangular blocky structure; friable; few fine roots; few fine pores; neutral; clear smooth boundary.

C1—10 to 15 inches; dark brown (10YR 4/3) loam; many fine faint brown (10YR 5/3) and few medium faint dark yellowish brown (10YR 4/4) mottles; weak medium and coarse subangular blocky structure; friable; few fine roots; many fine pores; neutral; clear smooth boundary.

C2—15 to 22 inches; brown (10YR 5/3) loam; few fine faint dark brown (10YR 4/3) and brown (7.5YR 5/2) mottles; moderate medium subangular blocky structure; friable; few fine roots; many fine pores; neutral; clear smooth boundary.

C3—22 to 34 inches; dark gray (10YR 4/1) loam that has thin strata of silty clay loam; few fine distinct dark brown (7.5YR 3/2) and few medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine and medium pores; neutral; clear smooth boundary.

C4—34 to 42 inches; pale brown (10YR 6/3) loam that has thin strata of silty clay loam; many medium faint gray (10YR 6/1) and many medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; slight effervescence; mildly alkaline; clear wavy boundary.

C5—42 to 60 inches; light brownish gray (10YR 6/2) loam that has thin strata of silty clay loam and sandy loam; few medium distinct yellowish brown (10YR 5/6) and many fine faint gray (10YR 5/1) mottles; massive; friable; slight effervescence; mildly alkaline.

The upper 40 inches is medium acid to mildly alkaline. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam or loam. The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 1 to 3. It is silt loam or loam that has thin strata of silty clay loam. Below a depth of 40 inches, it also has thin strata of sandy loam or coarse textured material. The strata are 0.25 inch to 3.0 inches thick.

Eldean Variant

The Eldean Variant consists of well drained soils on stream terraces. These soils formed in clayey and loamy outwash that is moderately deep over calcareous gravelly loamy coarse sand. They are moderately slowly permeable to moderately rapidly permeable in the subsoil and moderately rapidly permeable to very rapidly permeable in the underlying material. Slopes range from 0 to 2 percent.

Eldean Variant soils are similar to Fox soils and are near Sleeth and Westland soils. Fox soils have a surface layer that is lighter colored than that of the Eldean Variant soils. Also, they are less clayey in the subsoil. Sleeth soils are in the lower landscape positions. Their subsoil is mottled and is less clayey than that of the Eldean Variant soils. Westland soils are on the lowest part of the landscape. Their solum is grayer than that of the Eldean Variant soils.

Typical pedon of Eldean Variant loam, 0 to 2 percent slopes, in a cultivated field; 200 feet west and 2,450 feet south of the northeast corner of sec. 9, T. 21 N., R. 13 E.

Ap—0 to 8 inches; dark brown (10YR 3/3) loam, dark brown (10YR 4/3) dry; weak fine and medium granular structure; friable; many fine roots; common fine pores; medium acid; abrupt smooth boundary.

Bt1—8 to 16 inches; dark reddish brown (5YR 3/3) clay loam; moderate medium subangular blocky structure; firm; many fine roots; many fine pores; thick continuous very dusky red (10R 2/2) clay films on faces of peds; pale brown (10YR 6/3) bridges between sand grains; about 12 percent fine gravel; slightly acid; clear wavy boundary.

Bt2—16 to 20 inches; dark reddish brown (5YR 3/3) gravelly clay; weak medium prismatic structure parting to weak medium subangular blocky; firm; common fine roots; many medium and fine pores; thin continuous very dusky red (10R 2/2) clay films on faces of peds; pale brown (10YR 6/3) bridges between sand grains; about 18 percent fine and coarse gravel; slightly acid; clear wavy boundary.

2BC—20 to 25 inches; dark reddish brown (5YR 3/3) very gravelly coarse sandy loam; weak fine subangular blocky structure; firm; few fine roots; thin discontinuous very dusky red (10R 2/2) clay films on faces of peds; about 36 percent coarse gravel; slight effervescence; mildly alkaline; clear wavy boundary.

2C1—25 to 33 inches; reddish brown (5YR 4/3) gravelly loamy coarse sand; single grain; loose; about 24 percent coarse gravel; strong effervescence; mildly alkaline; clear wavy boundary.

2C2—33 to 60 inches; pale brown (10YR 6/3) gravelly loamy coarse sand; single grain; loose; about 34 percent coarse gravel; strong effervescence; mildly alkaline.

The thickness of the solum is 24 to 40 inches and is the same as the depth to loose, stratified gravelly loamy coarse sand or sand. The Ap horizon has hue of 10YR or 7.5YR and value and chroma of 2 or 3. Some pedons have an A horizon. This horizon is 2 to 6 inches thick. It is very dark gray (10YR 3/1) loam. The upper part of the Bt horizon has hue of 10YR, 7.5YR, or 5YR and value and chroma of 3 or 4. The Bt horizon ranges from clay loam to gravelly clay. The 2BC horizon has hue of 7.5YR or 5YR, value of 3, and chroma of 2 to 4. It is sandy loam, sandy clay loam, gravelly sandy loam, gravelly sandy clay loam, or very gravelly coarse sandy loam. It is neutral or mildly alkaline. The 2C horizon is mildly alkaline or moderately alkaline.

Fincastle Series

The Fincastle series consists of deep, somewhat poorly drained soils on till plains. These soils formed in loess and in the underlying glacial till. They are moderately permeable in the subsoil and moderately slowly permeable in the underlying material. Slopes are 0 to 1 percent.

Fincastle soils are commonly near Celina, Crosby, and Treaty soils. Celina soils have more clay and are browner throughout the solum than the Fincastle soils. They are on the slightly higher slopes. Crosby soils are more clayey in the subsoil than the Fincastle soils. They are in landscape positions similar to those of the Fincastle soils. Treaty soils are grayer throughout the solum than the Fincastle soils. They are in the lower areas in depressions and on flats.

Typical pedon of Fincastle silt loam, in a cultivated area of Fincastle-Crosby silt loams, 0 to 1 percent slopes; 200 feet west and 100 feet south of the northeast corner of sec. 36, T. 20 N., R. 13 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; many fine roots; many fine and medium pores; neutral; abrupt smooth boundary.

E—9 to 12 inches; grayish brown (10YR 5/2) silt loam; common fine distinct yellowish brown (10YR 5/4) and light yellowish brown (10YR 6/4) mottles; weak medium platy structure parting to moderate medium subangular blocky; friable; many fine roots; many fine and medium pores; neutral; clear wavy boundary.

Bt1—12 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; many medium faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many fine and medium pores; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; thin very dark gray (10YR 3/1) organic stains and light brownish gray (10YR 6/2) silt coatings on faces of peds; neutral; clear wavy boundary.

Bt2—20 to 34 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many fine and medium pores; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; light brownish gray (10YR 6/2) silt coatings in vertical cracks and roots channels; neutral; clear wavy boundary.

2BC—34 to 45 inches; grayish brown (10YR 5/2) silt loam; many medium distinct yellowish brown (10YR 5/6) and gray (10YR 6/1) mottles; weak medium subangular blocky structure; firm; few fine roots; many fine and medium pores; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; slight effervescence; mildly alkaline; clear wavy boundary.

2C—45 to 60 inches; yellowish brown (10YR 5/4) loam; many coarse distinct yellowish brown (10YR 5/8) and grayish brown (10YR 5/2) mottles; massive; firm; common fine and medium pores; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The loess mantle is 22 to 40 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is slightly acid or neutral. The E horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

Fox Series

The Fox series consists of well drained soils on stream terraces. These soils are moderately deep over sand and gravel. They formed in loamy outwash material. They are moderately permeable in the subsoil and rapidly permeable in the underlying material. Slopes range from 0 to 12 percent.

Fox soils are similar to Eldean Variant soils and are near Sleeth and Westland soils. Eldean Variant soils are more clayey in the subsoil than the Fox soils. Sleeth soils have mottles in the subsoil. They are in the lower landscape positions. Westland soils have a grayish solum. They are in depressions.

Typical pedon of Fox loam, 2 to 6 percent slopes, in a cultivated field; 800 feet west and 200 feet north of the southeast corner of sec. 23, T. 20 N., R. 12 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) loam; weak medium granular structure; friable; many fine roots; many very fine pores; about 2 percent fine gravel; strongly acid; abrupt smooth boundary.

E—8 to 11 inches; dark brown (10YR 4/3) loam; weak medium platy structure parting to weak fine angular blocky; friable; common fine roots; many fine and medium pores; about 2 percent fine gravel; medium acid; clear wavy boundary.

2Bt1—11 to 18 inches; reddish brown (5YR 4/4) clay loam; moderate coarse subangular blocky structure; firm; common fine roots; few medium pores; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; about 5 percent fine gravel; medium acid; gradual wavy boundary.

2Bt2—18 to 27 inches; dark reddish brown (5YR 3/3) clay loam; moderate medium subangular blocky structure; firm; few fine roots; few medium pores; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; about 5 percent coarse gravel; neutral; gradual wavy boundary.

2BC—27 to 35 inches; dark reddish brown (5YR 3/2) sandy clay loam; weak fine and medium subangular blocky structure; firm; few fine roots; few medium pores; thin discontinuous dark reddish brown (5YR 2/2) clay films on faces of peds; about 5 percent coarse gravel; slight effervescence; mildly alkaline; clear smooth boundary.

2C—35 to 60 inches; yellowish brown (10YR 5/4) very gravelly coarse sand; single grain; loose; about 45 percent coarse gravel; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is loam or clay loam. The Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 or 4, and chroma of 3 to 5. It is loam, gravelly clay loam, clay loam, sandy clay loam, or gravelly sandy clay loam. The 2C horizon varies widely in texture. The thickness of the strata of sand and gravel also varies widely.

Glynwood Series

The Glynwood series consists of deep, moderately well drained, slowly permeable soils on till plains and moraines. These soils formed in silty, clayey, and loamy glacial till. Slopes range from 1 to 4 percent.

The Glynwood soils in Randolph County are taxadjuncts to the series because they change abruptly in texture between the Ap or E horizon and the 2Bt1 horizon. This difference, however, does not affect the usefulness or behavior of the soils.

Glynwood soils are near Blount, Morley, and Pewamo soils. Blount soils have grayish mottles in the upper part of the subsoil. They are in the slightly lower landscape positions or in positions similar to those of the Glynwood soils. Morley soils are browner in the subsoil than the Glynwood soils. They are in the higher landscape positions. Pewamo soils are grayer throughout the solum than the Glynwood soils. They are in the lower landscape positions.

Typical pedon of Glynwood silt loam, 1 to 4 percent slopes, eroded, in a cultivated field; 380 feet west and 1,080 feet north of the southeast corner of sec. 19, T. 21 N., R. 14 E.

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; moderate medium granular structure; friable; many fine roots; many very fine pores; about 1 percent fine gravel; medium acid; abrupt smooth boundary.

2Bt1—8 to 12 inches; dark brown (10YR 4/3) clay; few medium faint brown (10YR 5/3) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; many fine roots; many very fine pores; thin continuous dark brown (10YR 3/3) clay films on faces of peds; medium acid; clear smooth boundary.

2Bt2—12 to 21 inches; dark brown (10YR 4/3) clay; few fine distinct yellowish brown (10YR 5/8) and few fine faint grayish brown (10YR 5/2) mottles; moderate fine prismatic structure parting to moderate medium subangular blocky; firm; many fine and medium roots; few fine pores; thin continuous dark brown (10YR 3/3) clay films on faces of peds; neutral; clear smooth boundary.

2Bt3—21 to 26 inches; dark brown (10YR 4/3) clay; common medium distinct brown (10YR 5/3) mottles; weak coarse prismatic structure parting to moderate coarse subangular blocky; firm; few medium roots; few medium and fine pores; thin discontinuous dark brown (10YR 3/3) clay films on faces of peds; about 1 percent fine gravel; slight effervescence; mildly alkaline; clear smooth boundary.

2C1—26 to 38 inches; brown (10YR 5/3) clay loam; common medium distinct yellowish brown (10YR 5/8) and dark brown (10YR 4/3) mottles; moderate medium platy structure; firm; few fine roots; light gray (10YR 7/2) silt coatings on faces of peds; about 1 percent fine gravel; strong effervescence; moderately alkaline; clear smooth boundary.

2C2—38 to 60 inches; yellowish brown (10YR 5/4) clay loam; many coarse distinct yellowish brown (10YR 5/8) mottles; weak medium platy structure; very firm; light gray (10YR 7/2) silt coatings on faces of peds; about 1 percent fine gravel; strong effervescence; moderately alkaline.

The solum is 16 to 40 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Pedons in wooded areas have an A horizon. This horizon is 1 to 3 inches thick. It has hue of 10YR, value of 3, and chroma of 1 or 2. Some pedons have an E horizon. This horizon is 1 to 4 inches thick. It has hue of 10YR, value of 5 or 6, and chroma of 2. The 2Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is silty clay loam, clay loam, silty clay, or clay.

Linwood Series

The Linwood series consists of deep, very poorly drained soils in deep depressions on uplands and stream terraces. These soils formed in organic material underlain by loamy glacial deposits. They are moderately slowly permeable to moderately rapidly permeable in the organic material and moderately permeable in the underlying material. Slopes range from 0 to 2 percent.

Linwood soils are commonly near Carlisle, Patton, Pewamo, Treaty, and Wallkill soils. Carlisle soils formed in organic material more than 65 inches thick. They are in landscape positions similar to those of the Linwood soils. Patton, Pewamo, and Treaty soils have a mineral solum. They are in the slightly higher areas in the depressions. Wallkill soils have mineral deposits 16 to 40 inches deep over organic material. They are near the outer edges of the depressions.

Typical pedon of Linwood muck, undrained, in a pasture; 1,700 feet west and 1,450 feet north of the southeast corner of sec. 36, T. 19 N., R. 1 W.

Oa1—0 to 7 inches; sapric material, black (N 2/0) broken face and rubbed; about 5 percent fiber when broken, less than 1 percent when rubbed or pressed; moderate fine and very fine granular structure; friable; slightly acid; clear smooth boundary.

Oa2—7 to 15 inches; sapric material, black (N 2/0) broken face, very dark brown (7.5YR 2/2) rubbed; about 5 percent fiber when broken, less than 5 percent when rubbed; moderate medium granular structure; friable; slightly acid; clear smooth boundary.

Oa3—15 to 18 inches; sapric material, yellowish red (5YR 4/6) broken face, reddish brown (5YR 4/4) rubbed; about 10 percent fiber when broken, 5 percent when pressed or rubbed; weak coarse granular structure; friable; slightly acid; abrupt smooth boundary.

2Cg1—18 to 26 inches; olive gray (5Y 5/2) clay loam; many coarse prominent yellowish brown (10YR 5/8) mottles; massive; firm; black (10YR 2/1) organic stains on faces of peds; about 5 percent fine gravel; neutral; clear wavy boundary.

2Cg2—26 to 60 inches; grayish brown (2.5Y 5/2) clay loam; many medium prominent yellowish brown (10YR 5/8) and common medium distinct olive (5Y 4/4) mottles; massive; firm; about 5 percent gravel; slight effervescence; mildly alkaline.

The organic material ranges from 16 to 51 inches in thickness. The content of decomposed material generally increases with increasing depth and varies within short distances. Some pedons have a thin layer of hemic material. The 2Cg horizon is generally loam or clay loam but in some pedons is sandy loam or silty clay loam.

Losantville Series

The Losantville series consists of deep, well drained soils on till plains and moraines. These soils formed in loamy glacial till. They are moderately slowly permeable in the subsoil and slowly permeable in the underlying material. Slopes range from 2 to 25 percent.

Losantville soils are similar to Morley soils and are near Celina, Miami, Patton, and Treaty soils. Morley soils are more clayey in the underlying material than the Losantville soils. Celina soils have a solum that is thicker than that of the Losantville soils and have grayish mottles in the lower part of the subsoil. They are in the slightly lower landscape positions. Miami soils are less clayey in the subsoil than the Losantville soils. They are in landscape positions similar to those of the Losantville soils. Patton and Treaty soils are grayer throughout the solum than the Losantville soils. They are nearly level and are in broad depressions.

Typical pedon of Losantville silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 2,500 feet west and 500 feet north of the southeast corner of sec. 24, T. 19 N., R. 15 E.

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; few fine and medium roots; many fine and few medium pores; neutral; abrupt smooth boundary.

Bt—10 to 18 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few fine and medium roots; many fine and few medium pores; thick continuous dark brown (10YR 3/3) clay films on faces of peds; neutral; clear wavy boundary.

BC—18 to 23 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; many fine and few medium pores; thin discontinuous brown (10YR 5/3) clay films on faces of peds; slight effervescence; mildly alkaline; clear wavy boundary.

C—23 to 60 inches; yellowish brown (10YR 5/6) loam; common fine faint yellowish brown (10YR 5/8) mottles; massive; firm; light gray (10YR 7/2) silt coatings on faces of peds; strong effervescence; moderately alkaline.

The thickness of the solum typically is 12 to 22 inches but ranges from 10 to 27 inches. The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. It ranges from silt loam to clay loam. It is medium acid to neutral. Pedons in wooded areas have an A horizon. This horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The Bt and BC horizons are neutral or mildly alkaline. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is clay loam or clay. The BC horizon is clay loam or loam. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 6.

Miami Series

The Miami series consists of deep, well drained soils on till plains. These soils formed in loess and in the underlying loamy till over loamy gravelly outwash. Permeability is moderate in the upper part of the profile and is rapid in the lower part of the underlying material. Slopes range from 0 to 6 percent.

Miami soils are near Losantville, Patton, and Treaty soils. Losantville soils are more clayey in the subsoil than the Miami soils. They are in landscape positions similar to those of the Miami soils. Patton and Treaty soils have a surface layer that is darker than that of the Miami soils. Also, they are grayer throughout the solum. They are in the lower depressions.

Typical pedon of Miami silt loam, gravelly substratum, 2 to 6 percent slopes, eroded, in a cultivated field; 1,100 feet west and 300 feet south of the northeast corner of sec. 1, T. 16 N., R. 1 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; common fine roots; many fine and medium pores; slightly acid; abrupt smooth boundary.

Bt1—10 to 16 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; firm; common fine roots; many fine and medium pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—16 to 24 inches; brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; many fine and medium pores; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; neutral; clear wavy boundary.

2Bt3—24 to 32 inches; brown (7.5YR 4/4) clay loam; moderate medium and coarse angular blocky structure; firm; few fine roots; many fine and medium pores; thick continuous dark brown (7.5YR 3/4) clay films on faces of peds; neutral; clear wavy boundary.

2C1—32 to 38 inches; brown (10YR 5/3) loam; massive; firm; few fine roots; few medium pores; few distinct dark brown (7.5YR 3/2) organic stains on faces of peds; slight effervescence; mildly alkaline; clear wavy boundary.

2C2—38 to 65 inches; brown (10YR 5/3) loam; massive; friable; few very fine pores; few distinct dark brown (7.5YR 3/2) organic stains on faces of peds; strong effervescence; moderately alkaline; clear wavy boundary.

3C3—65 to 80 inches; reddish brown (5YR 4/4) gravelly sandy clay loam; massive; friable; strong effervescence; moderately alkaline.

The thickness of the solum typically is 28 to 36 inches but ranges from 24 to 42 inches. The loess mantle is 5 to 25 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is slightly acid or neutral. Pedons in wooded areas have an A horizon, which is commonly very dark grayish brown (10YR 3/2). Some pedons have a BA horizon. This horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam or loam. The Bt and 2Bt horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. They are medium acid to neutral. Some pedons have a 2BC horizon. This horizon is clay loam or loam. It is neutral or mildly alkaline. The 2C horizon has hue of 10YR, value of 5, and chroma of 3 or 4. The 3C horizon has hue of 10YR to 5YR, value of 3 or 4, and chroma of 4. It ranges from sandy clay loam to sand and gravel.

Morley Series

The Morley series consists of deep, well drained soils on till plains and moraines. These soils formed in silty, clayey, and loamy glacial till. They are moderately slowly permeable in the subsoil and slowly permeable in the underlying material. Slopes range from 3 to 12 percent.

Morley soils are similar to Losantville soils and are near Glynwood and Pewamo soils. Losantville soils have a solum that is thinner than that of the Morley soils. Also, they are less clayey in the underlying material. They are in landscape positions similar to those of the Morley soils. Glynwood soils have mottles in the lower part of the subsoil. They are on the slightly lower parts of the landscape. Pewamo soils have a thick, dark surface layer and are grayer throughout the solum than the Morley soils. They are in the lower landscape positions.

Typical pedon of Morley silt loam, 3 to 6 percent slopes, in a cultivated field; 1,500 feet west and 2,520 feet south of the northeast corner of sec. 6, T. 21 N., R. 15 E.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; many fine and medium pores; neutral; abrupt smooth boundary.

Bt1—8 to 11 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; many fine roots; many fine and medium pores; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; neutral; clear wavy boundary.

Bt2—11 to 16 inches; yellowish brown (10YR 5/4) silty clay; moderate medium angular blocky structure; firm; many fine roots; many fine and medium pores; thick continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt3—16 to 24 inches; dark yellowish brown (10YR 4/4) clay; moderate medium subangular blocky structure; firm; common fine roots; many fine and medium pores; thick continuous dark brown (10YR 4/3) clay films on faces of peds; neutral; clear wavy boundary.

BC—24 to 32 inches; brown (10YR 5/3) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; common fine and medium pores; thick continuous dark brown (10YR 3/3) clay films on faces of peds; slight effervescence; mildly alkaline; clear wavy boundary.

C1—32 to 42 inches; pale brown (10YR 6/3) silty clay loam; massive; firm; few fine roots; common fine and medium pores; thin discontinuous brown (10YR 5/3) organic films on faces of peds; slight effervescence; moderately alkaline; clear wavy boundary.

C2—42 to 60 inches; pale brown (10YR 6/3) silty clay loam; massive; very firm; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick. The Ap horizon has hue of 10YR, value 4 or 5, and chroma of 2 to 4. It is clay loam or silt loam. Pedons in wooded areas have an A horizon. This horizon is 1 to 3 inches thick. It has hue of 10YR, value of 3, and chroma of 1 or 2. Some pedons have an E horizon. This horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is clay loam, silty clay loam, silty clay, or clay. It is medium acid to neutral. The C horizon is mildly alkaline or moderately alkaline. It is clay loam or silty clay loam.

Patton Series

The Patton series consists of deep, poorly drained soils on uplands and lake plains. These soils formed in silty lacustrine sediments. They are moderately permeable in the subsoil and moderately slowly permeable in the underlying material. Slopes range from 0 to 2 percent.

Patton soils are similar to Treaty soils and are near Carlisle, Losantville, Linwood, Miami, and Wallkill soils. Treaty soils formed in glacial till. Carlisle soils formed in more than 65 inches of organic material. They are in deep depressions. Losantville and Miami soils are browner in the solum than the Patton soils. They are in the higher landscape positions. Linwood soils formed in organic material 16 to 51 inches deep over loamy sediments. They are in deep depressions. Wallkill soils formed in silty deposits and in the underlying organic material, which is at a depth of 16 to 40 inches. They are in landscape positions similar to those of the Patton soils.

Typical pedon of Patton silty clay loam, in a cultivated field; 100 feet east and 850 feet south of the northwest corner of sec. 17, T. 20 N., R. 15 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; common fine roots; many fine pores; medium acid; clear smooth boundary.

AB—7 to 11 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; firm; common fine roots; many fine pores; medium acid; clear smooth boundary.

Bg1—11 to 16 inches; gray (10YR 5/1) silty clay loam; common medium distinct yellowish brown (10YR 5/4) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; many medium and fine pores; dark gray (10YR 4/1) clay flows on vertical faces of prisms; neutral; clear wavy boundary.

Bg2—16 to 24 inches; gray (10YR 5/1) silty clay loam; many medium distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to weak coarse angular blocky; firm; common fine roots; many medium and fine pores; dark gray (10YR 4/1) clay flows on vertical faces of prisms; neutral; clear wavy boundary.

Bg3—24 to 32 inches; gray (5Y 6/1) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium angular blocky; firm; common fine roots; many medium and fine pores; dark gray (10YR 4/1) clay flows on vertical faces of prisms; slight effervescence; mildly alkaline; clear wavy boundary.

C1—32 to 55 inches; gray (10YR 5/1) silt loam; many medium distinct yellowish brown (10YR 5/8) mottles; massive; firm; few fine roots; common medium and fine pores; gray (10YR 5/1) clay flows on vertical faces of prisms; few thin black (10YR 2/1) iron and manganese concretions; slight effervescence; mildly alkaline; clear wavy boundary.

2C2—55 to 64 inches; gray (10YR 6/1) silt loam that has thin strata of fine sandy loam; few fine distinct yellowish brown (10YR 5/4) mottles; massive; friable; common medium and fine pores; slight effervescence; moderately alkaline; clear wavy boundary.

2C3—64 to 80 inches; gray (10YR 5/1) gravelly sandy loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; common medium and fine pores; about 15 percent gravel; strong effervescence; strongly alkaline.

The thickness of the solum and the depth to carbonates are 30 to 40 inches. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silt loam or silty clay loam. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2.

Pewamo Series

The Pewamo series consists of deep, very poorly drained, moderately slowly permeable soils on till plains and lake plains. These soils formed in silty and clayey glacial till. Slopes range from 0 to 2 percent.

The Pewamo soils in Randolph County are taxadjuncts to the series because they do not have an argillic horizon and because they irregularly decrease in content of organic matter with increasing depth. These differences, however, do not affect the usefulness or behavior of the soils.

Pewamo soils are near Blount, Glynwood, and Morley soils. The nearby soils have a surface layer that is lighter colored than that of the Pewamo soils. They are in the higher landscape positions.

Typical pedon of Pewamo silty clay loam, in a cultivated field; 580 feet south and 2,080 feet west of the northeast corner of sec. 23, T. 21 N., R. 13 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; strong fine granular structure; friable; few fine roots; few fine pores; neutral; abrupt smooth boundary.

AB—9 to 18 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; few medium pores; neutral; clear smooth boundary.

Btg1—18 to 30 inches; dark gray (10YR 4/1) silty clay; few fine prominent reddish brown (5YR 5/4) and common fine faint gray (10YR 5/1) mottles; weak and moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; few medium pores; thin light gray (10YR 7/1) calcium carbonate deposits on faces of prisms; very dark gray (10YR 3/1) organic flows; neutral; clear smooth boundary.

Btg2—30 to 46 inches; gray (10YR 5/1) silty clay; many coarse prominent yellowish red (5YR 5/6) and faint dark gray (10YR 4/1) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common fine pores; thin light gray (10YR 7/1) calcium carbonate deposits on faces of prisms; very dark gray (10YR 3/1) organic flows; slight effervescence; mildly alkaline; clear wavy boundary.

BCg—46 to 50 inches; gray (10YR 5/1) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and many medium faint dark gray (10YR 4/1) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few fine roots; common fine pores; thin light gray (10YR 7/1) calcium carbonate deposits on faces of prisms; very dark gray (10YR 3/1) organic flows; slight effervescence; mildly alkaline; clear wavy boundary.

2Cg—50 to 65 inches; light brownish gray (10YR 6/2) silty clay loam; many coarse distinct yellowish brown (10YR 5/6) and many coarse faint brown (10YR 5/3) mottles; weak thick platy structure; very firm; about 6 percent very fine gravel; strong effervescence; moderately alkaline.

The solum is 28 to 60 inches thick. The depth to carbonates is 25 to 50 inches. The content of gravel is 0 to 8 percent throughout the profile.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Btg horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. It is silty clay loam, silty clay, clay, or clay loam. The 2Cg horizon is clay loam or silty clay loam.

Saranac Series

The Saranac series consists of deep, poorly drained, moderately slowly permeable soils on flood plains. These soils formed in clayey alluvial deposits. Slopes range from 0 to 2 percent.

Saranac soils are similar to Sloan soils and are near Allison Variant soils. Sloan soils are less clayey in the solum than the Saranac soils. The well drained Allison Variant soils are browner throughout the solum than the Saranac soils. Also, they are slightly higher on the landscape and generally are closer to large stream channels.

Typical pedon of Saranac silty clay, frequently flooded, in a cultivated field; 300 feet east and 1,400 feet north of the southwest corner of sec. 9, T. 21 N., R. 13 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; common fine roots; many very fine pores; neutral; abrupt smooth boundary.

AB—8 to 19 inches; very dark grayish brown (10YR 3/2) silty clay, grayish brown (10YR 5/2) dry; weak coarse subangular blocky structure; firm; common fine roots; many fine pores; neutral; clear smooth boundary.

Bg1—19 to 30 inches; dark gray (10YR 4/1) clay; few fine distinct yellowish brown (10YR 5/8) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many fine and medium pores; many black (10YR 2/1) iron and manganese concretions; neutral; clear wavy boundary.

Bg2—30 to 40 inches; dark gray (10YR 4/1) clay that has thin strata of fine sand; few fine distinct yellowish brown (10YR 5/8) mottles; massive; firm; few medium roots; many medium pores; many very dark gray (10YR 3/1) and black (10YR 2/1) iron and manganese concretions; neutral; gradual wavy boundary.

Bg3—40 to 52 inches; gray (10YR 5/1) silty clay that has thin strata of fine sand; many coarse distinct yellowish brown (10YR 5/8) and common medium faint dark gray (10YR 4/1) mottles; massive; firm; few medium pores; many black (10YR 2/1) iron and manganese concretions; neutral; gradual wavy boundary.

Cg—52 to 60 inches; gray (10YR 5/1) clay loam that has thin strata of fine sand; many coarse distinct yellowish brown (10YR 5/8) and many medium faint dark gray (10YR 4/1) mottles; massive; firm; many black (10YR 2/1) iron and manganese concretions; mildly alkaline.

The solum is slightly acid to mildly alkaline. The depth to calcareous material ranges from about 20 to 60 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silty clay loam or silty clay. The Bg horizon has hue of 2.5Y, 5Y, or 10YR, value of 4 or 5, and chroma of 1 or 2. It is silty clay loam, silty clay, or clay. The Cg horizon is stratified clay, silty clay, clay loam, or sand.

Sleeth Series

The Sleeth series consists of deep, somewhat poorly drained soils on outwash plains. These soils formed in loamy outwash over calcareous, stratified gravelly sand and sand. They are moderately permeable in the subsoil and very rapidly permeable in the underlying material. Slopes range from 0 to 2 percent.

Sleeth soils are near Eldean Variant, Fox, and Westland soils. Eldean Variant soils are more clayey than the Sleeth soils and are browner throughout the solum. They are in the higher landscape positions. Fox soils also are in the higher landscape positions. They are browner in the subsoil than the Sleeth soils. Westland soils have grayish colors throughout the solum. They are in the lower landscape positions.

Typical pedon of Sleeth loam, in a cultivated field; 300 feet west and 800 feet north of the southeast corner of sec. 9, T. 21 N., R. 13 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; common fine roots; common fine pores; about 3 percent fine gravel; neutral; abrupt smooth boundary.

E—9 to 12 inches; grayish brown (10YR 5/2) loam; weak medium granular structure; friable; common fine roots; common fine pores; about 4 percent gravel; neutral; clear smooth boundary.

Bt1—12 to 24 inches; dark grayish brown (10YR 4/2) clay loam; many medium faint dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; many fine pores; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; thin dark grayish brown (10YR 4/2) worm casts inside peds; about 5 percent fine gravel; neutral; clear wavy boundary.

Bt2—24 to 36 inches; yellowish brown (10YR 5/4) clay loam; many coarse faint yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; firm; few fine roots; few fine and medium pores; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; dark grayish brown (10YR 4/2) worm casts inside peds; about 5 percent fine gravel; neutral; clear wavy boundary.

BC—36 to 50 inches; yellowish brown (10YR 5/4) loam; many coarse faint yellowish brown (10YR 5/6) and few fine faint pale brown (10YR 6/3) mottles; weak coarse subangular blocky structure; firm; many fine pores; dark grayish brown (10YR 4/2) worm casts inside peds; about 10 percent fine gravel; slight effervescence; mildly alkaline; clear wavy boundary.

2C—50 to 65 inches; grayish brown (10YR 5/2) gravelly loamy fine sand; many coarse faint dark grayish brown (10YR 4/2) and pale brown (10YR 6/3) mottles; massive; friable; about 20 percent fine and coarse gravel; strong effervescence; moderately alkaline.

The solum is 40 to 50 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. It is loam or silt loam. Plowing commonly has mixed the E horizon with the Ap horizon. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is silty clay loam, clay loam, or sandy clay loam.

Sloan Series

The Sloan series consists of deep, very poorly drained, moderately permeable or moderately slowly permeable soils on flood plains. These soils formed in silty and loamy alluvial deposits. Slopes range from 0 to 2 percent.

Sloan soils are similar to Saranac soils and are near Eel soils. Saranac soils are more clayey in the subsoil than the Sloan soils. Eel soils are browner in the solum than the Sloan soils. They are in the slightly higher landscape positions and are moderately well drained.

Typical pedon of Sloan silt loam, frequently flooded, in a pasture; 60 feet west and 120 feet north of the southeast corner of sec. 26, T. 21 N., R. 13 E.

A1—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine and medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A2—8 to 16 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; few fine distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure parting to weak medium granular; friable; common fine roots; many fine and few medium pores; about 1 percent fine gravel; neutral; clear smooth boundary.

Bw1—16 to 22 inches; grayish brown (2.5Y 5/2) clay loam; few fine prominent yellowish brown (10YR 5/6) and brown (7.5YR 5/4) mottles; moderate medium subangular blocky structure parting to moderate medium granular; friable; common fine roots; many fine and medium pores; about 2 percent fine gravel; neutral; gradual wavy boundary.

Bw2—22 to 32 inches; dark gray (10YR 4/1) loam; many fine distinct brown (7.5YR 5/4) mottles; moderate medium and coarse subangular blocky structure; friable; common fine roots; few fine and medium pores; about 2 percent gravel; neutral; gradual wavy boundary.

BC—32 to 40 inches; grayish brown (2.5Y 5/2) clay loam that has thin strata of silty clay loam; many medium distinct dark gray (10YR 4/1) and yellowish brown (10YR 5/6) and common fine distinct brown (7.5YR 5/4) mottles; moderate medium subangular blocky structure; friable; common fine roots; many medium pores; about 2 percent gravel; slight effervescence; mildly alkaline; gradual wavy boundary.

C1—40 to 75 inches; light brownish gray (10YR 6/2) loam that has thin strata of silt loam and sandy loam; many medium distinct yellowish brown (10YR 5/4) and common fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; few fine pores; about 8 percent fine gravel; strong effervescence; moderately alkaline; gradual smooth boundary.

C2—75 to 80 inches; gray (10YR 6/1) very fine sandy loam; common fine faint light brownish gray (10YR 6/2) mottles; massive; strong effervescence; moderately alkaline.

The solum ranges from slightly acid to mildly alkaline in the upper part and from neutral to moderately alkaline in the lower part. The depth to calcareous material ranges from about 20 to 40 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silt loam or silty clay loam. The Bw horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is silty clay loam, clay loam, silt loam, or loam. The C horizon is stratified loam, sandy loam, very fine sandy loam, fine sandy loam, or silt loam.

Treaty Series

The Treaty series consists of deep, very poorly drained soils on till plains and moraines. These soils formed in a thin layer of loess and in the underlying loamy glacial till. They are moderately permeable in the subsoil and moderately slowly permeable in the underlying material. Slopes range from 0 to 2 percent.

Treaty soils are similar to Patton soils and are near Celina, Crosby, Fincastle, and Miami soils. Patton soils have a solum that is thinner than that of the Treaty soils. They formed entirely in silty sediments. Celina soils are more clayey than the Treaty soils and are browner in the solum. They are in the higher landscape positions. Crosby and Fincastle soils are not dominantly grayish. They have less sand in the lower part of the subsoil than the Treaty soils. They are in the slightly higher landscape positions. Miami soils are more loamy in the subsoil than the Treaty soils. Also, they are browner in the solum. They are in the higher landscape positions.

Typical pedon of Treaty silt loam, in a cultivated field; 300 feet west and 1,300 feet south of the northeast corner of sec. 25, T. 20 N., R. 13 E.

Ap—0 to 7 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak medium granular structure; friable; common fine roots; few very fine pores; about 3 percent fine gravel; slightly acid; abrupt smooth boundary.

AB—7 to 11 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; friable; common fine roots; many fine and medium pores; about 2 percent fine gravel; slightly acid; clear smooth boundary.

Btg1—11 to 17 inches; dark gray (10YR 4/1) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; few fine roots; many medium pores; thin continuous very dark gray (10YR 3/1) clay films on faces of peds; about 2 percent fine gravel; neutral; clear wavy boundary.

Btg2—17 to 24 inches; gray (10YR 5/1) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; few fine and medium pores; thick continuous dark gray (10YR 4/1) clay films on faces of peds; about 2 percent fine gravel; neutral; clear wavy boundary.

Btg3—24 to 32 inches; gray (10YR 5/1) silty clay loam; common fine faint grayish brown (10YR 5/2) and many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate coarse subangular blocky; firm; few fine roots; thick continuous dark gray (10YR 4/1) clay films on faces of peds; about 2 percent fine gravel; neutral; clear wavy boundary.

2BCg—32 to 45 inches; grayish brown (10YR 5/2) silt loam; many coarse distinct yellowish brown (10YR 5/6) and many coarse faint gray (10YR 5/1) mottles; weak coarse subangular blocky structure; firm; few fine roots; about 2 percent fine gravel; slight effervescence; moderately alkaline; gradual wavy boundary.

2C—45 to 60 inches; yellowish brown (10YR 5/4) loam; few fine faint yellowish brown (10YR 5/6) and common medium distinct grayish brown (10YR 5/2) mottles; massive; firm; about 7 percent fine gravel; strong effervescence; moderately alkaline.

The solum ranges from 42 to 65 inches in thickness. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silt loam or silty clay loam. It is medium acid to neutral. The Btg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. It is slightly acid to mildly alkaline. It is clay loam, loam, silty clay loam, or silt loam. The 2C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is silt loam or loam.

Wallkill Series

The Wallkill series consists of deep, very poorly drained soils in deep depressions on till plains. These soils formed in silty alluvial deposits and in the underlying organic deposits. They are moderately permeable in the mineral material and moderately rapidly permeable or rapidly permeable in the organic material. Slopes range from 0 to 2 percent.

Wallkill soils are near Carlisle, Linwood, Patton, and Pewamo soils. Carlisle soils formed in more than 51 inches of organic material. They are in the lower depressions. Linwood soils formed in organic material 16 to 51 inches deep over loamy sediments. They are in landscape positions similar to those of the Wallkill soils. Patton and Pewamo soils are not underlain by organic material. They are in the slightly higher depressions.

Typical pedon of Wallkill silt loam, undrained, in a cultivated field; 900 feet west and 100 feet south of the northeast corner of sec. 23, T. 21 N., R. 13 E.

Ap—0 to 5 inches; dark grayish brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; moderate medium granular structure; friable; few fine roots; medium acid; abrupt smooth boundary.

Bg—5 to 12 inches; olive gray (5Y 5/2) silty clay loam; common fine faint gray (5Y 5/1) mottles; weak coarse prismatic structure; firm; few fine and medium roots; medium acid; clear smooth boundary.

Cg—12 to 18 inches; olive gray (5Y 5/2) silty clay loam; massive; friable; few fine roots; slightly acid; clear smooth boundary.

2Ab—18 to 34 inches; black (10YR 2/1) mucky silt loam, very dark brown (10YR 2/2) rubbed and pressed; about 2 percent fiber when broken, none when rubbed and pressed; massive; friable; neutral; gradual wavy boundary.

2Oa1—34 to 40 inches; black (5YR 2/1) sapric material, very dark gray (5YR 3/1) rubbed and pressed; about 15 percent fiber when broken, 5 percent when pressed and rubbed; massive; friable; medium acid; gradual wavy boundary.

2Oa2—40 to 47 inches; dark reddish brown (5YR 2/2) sapric material, dark reddish brown (5YR 3/2) rubbed and pressed; about 15 percent fiber when broken, 5 percent when rubbed; massive; friable; neutral; gradual irregular boundary.

3C—47 to 65 inches; olive gray (5Y 4/2) marl; about 5 percent fiber when broken; massive; friable; slight effervescence; mildly alkaline.

The mineral material is 16 to 40 inches deep over the organic material. The Ap horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 1 or 2. It is silty clay loam or silt loam. Some pedons have an A horizon, which is very dark grayish brown (10YR 3/2). The Bg and Cg horizons have hue of 10YR, 5Y, or 2.5Y, value of 3 to 5, and chroma of 1 or 2. They are silty clay loam or silt loam. The Bg horizon is medium acid to neutral. The 2Ab horizon has hue of 10YR, 7.5YR, 5Y, or 5YR, value of 2 or 3, and chroma of 1.

The 2Oa horizon has hue of 10YR, 7.5YR, or 5YR, value of 2 or 3, and chroma of 1 to 3. The content of undecomposed material generally increases with increasing depth and varies within short distances. Some pedons have a thin layer of fibric and hemic material. The 3C horizon has hue of 10YR, 5Y, or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is dominantly marl.

Westland Series

The Westland series consists of deep, very poorly drained, moderately permeable soils on outwash plains. These soils formed in loamy glacial outwash and in the underlying material weathered from limestone bedrock. Slopes range from 0 to 2 percent.

Westland soils are near Eldean Variant, Fox, and Sleeth soils. Eldean Variant soils have more clay in the subsoil than the Westland soils and are underlain by sand and gravel. They are in the higher landscape positions. Fox soils are more gravelly than the Westland soils and do not have mottles in the subsoil. They are in the higher landscape positions. Sleeth soils are not so gray in the upper part of the subsoil as the Westland soils. They are in the slightly higher landscape positions.

Typical pedon of Westland clay loam, limestone substratum, in a cultivated field; 200 feet north and 1,600 feet west of the southeast corner of sec. 4, T. 21 N., R. 12 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) clay loam, dark gray (10YR 4/1) dry; weak fine and moderate medium granular structure; friable; common fine roots; many medium pores; neutral; abrupt smooth boundary.

AB—9 to 14 inches; very dark gray (10YR 3/1) clay loam, dark gray (10YR 4/1) dry; weak coarse subangular blocky structure; firm; common fine roots; many medium pores; about 1 percent fine gravel; neutral; clear smooth boundary.

Btg1—14 to 21 inches; dark gray (10YR 4/1) clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many medium pores; thick discontinuous very dark gray (10YR 3/1) clay films on faces of peds; light yellowish brown (10YR 6/4) sand grains on faces of peds; about 3 percent fine gravel; neutral; clear wavy boundary.

Btg2—21 to 27 inches; dark gray (10YR 4/1) clay loam; many medium distinct yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to moderate coarse subangular blocky; firm; few fine roots; many medium pores; thin continuous very dark gray (10YR 3/1) clay films on faces of peds; light yellowish brown (10YR 6/4) sand grains on faces of peds; about 5 percent fine gravel; neutral; clear wavy boundary.

C1—27 to 38 inches; mottled yellowish brown (10YR 5/4) and brownish yellow (10YR 6/6) very channery loam; massive; firm; many medium pores; about 40 percent coarse fragments 1 to 5 inches in diameter; strong effervescence; moderately alkaline; gradual irregular boundary.

C2—38 to 45 inches; light yellowish brown (10YR 6/4) extremely flaggy loam; massive; firm; many medium pores; about 65 percent coarse fragments 1 to 10 inches in diameter; strong effervescence; moderately alkaline; abrupt smooth boundary.

2R—45 inches; hard limestone bedrock.

The solum is 27 to 45 inches thick. It is medium acid to neutral. The depth to limestone bedrock is 40 to 55 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Btg horizon is clay loam or gravelly clay loam. The Btg1 horizon has hue of 10YR, value of 3 to 5, and chroma of 1 or 2. The Btg2 horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma 1 or 2. The C horizon has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 1 to 6. It is gravelly loam, gravelly sand, sand, or channery, very channery, flaggy, very flaggy, or extremely flaggy loam. The content of partly weathered limestone fragments in this horizon ranges from 20 to 65 percent. The size and content of the fragments increase with increasing depth.

Formation of the Soils

This section relates the major factors of soil formation to the soils in the county. It also describes the processes of soil formation.

Factors of Soil Formation

Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil. Some time is always required for the differentiation of soil horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the other four.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. It determines the limits of the chemical and mineralogical composition of the soil. The parent materials of the soils in Randolph County generally were deposited by glaciers or by meltwater from the glaciers. Some of these materials were reworked and redeposited by the subsequent actions of water and wind. The last glacier covered the county about 12,000 to 15,000 years ago. Although most of the parent materials are of common glacial origin, their properties vary greatly, sometimes within small areas, depending on how the materials were deposited. The dominant parent materials in Randolph County were deposited as glacial till, outwash, lacustrine material, alluvium, and organic material.

Glacial till is material laid down directly by glaciers with a minimum of water action. It consists of particles of different sizes that are mixed together. Some of the small pebbles in glacial till have sharp corners, indicating that they have not been worn by water. The glacial till in Randolph County is calcareous, firm loam and clay loam. Losantville and Morley are examples of soils that formed in glacial till. These soils typically are medium textured and moderately fine textured and have well developed structure.

Outwash material was deposited by running water from melting glaciers. The size of the particles that make up outwash varies according to the velocity of the water that carried the material. When the water slowed down, the coarser particles were deposited. Finer particles, such as very fine sand, silt, and clay, were carried farther by the more slowly moving water. Outwash deposits generally occurs as layers of similar-size particles, such as sandy loam, sand, gravel, and other coarse particles. Eldean Variant and Fox are examples of soils that formed in outwash material.

Lacustrine material was deposited from still, or ponded, glacial meltwater. Because the coarser particles dropped out of moving water as outwash, only the finer particles, such as very fine sand, silt, and clay, remained to settle out in still water. Lacustrine deposits are dominantly silty or clayey but have thin lenses of sand. The soils in Randolph County that formed in lacustrine deposits typically are fine textured. Patton soils are an example.

Alluvial material was recently deposited by floodwater along present streams. This material varies in texture, depending on the speed of the water from which it was deposited. The alluvial material deposited along a swift stream, such as the White River, is coarser textured than that deposited along a slow, sluggish stream, such as the Mississinewa River. Allison Variant and Saranac are examples of soils that formed in alluvium on bottom land.

Organic material is made up of deposits of plant remains. After the glaciers withdrew from the survey area, water was left standing in depressions on outwash plains, lake plains, and till plains. Grasses and sedges growing around the edges of these lakes died, and their remains fell to the bottom. Because of wetness, the plant remains did not decompose quickly. Later, white cedar and other water-tolerant trees grew in the areas.

As these trees died, their remains became a part of the organic accumulation. The lakes were eventually filled with organic material, which developed into peat. In some areas the plant remains subsequently decomposed into muck. In other areas the material has changed little since deposition. Carlisle soils are an example of soils that formed in organic material.

Plant and Animal Life

Plants have been the principal organisms influencing the soils in Randolph County. Bacteria, fungi, and earthworms, however, also have been important. The chief contribution of plant and animal life to soil formation is the addition of organic matter and nitrogen to the soil. The kind of organic material on and in the soil depends on the kinds of plants that have grown on the soil. The remains of these plants accumulated on the surface, decayed, and eventually became humus. The roots of the plants provided channels for the downward movement of water through the soil and added organic matter and plant nutrients as they decayed.

The native vegetation in Randolph County was mainly deciduous trees. Differences in natural soil drainage and minor variations in the kind of parent material affected the composition of the forest species. The well drained upland soils, such as Morley and Miami soils, mainly supported sugar maple, beech, red oak, shagbark hickory, and black walnut. The somewhat poorly drained Blount soils supported red oak, elm, green ash, bur oak, and pin oak. The wet soils on bottom land supported primarily black ash, sycamore, yellow-poplar, and American basswood. In a few wet areas, sphagnum and other mosses contributed substantially to the accumulation of organic matter.

Climate

Climate helps to determine the kind of plant and animal life on and in the soil, the amount of water available for the weathering of minerals and the translocation of soil material, and the rate of chemical reactions in the soil. The climate in Randolph County is cool and humid. It is presumably similar to the climate under which the soils formed. Because it is uniform throughout the county, it has not caused significant differences among the soils in the county.

Relief

Relief has markedly affected the soils in Randolph County through its effect on natural drainage, runoff, erosion, plant cover, and soil temperature. Slopes range from 0 to 25 percent. Runoff is most rapid in the steeper slopes. Water is temporarily ponded in low areas.

Natural soil drainage in the county ranges from well drained on the ridgetops to very poorly drained in the depressions. Through its effect on aeration of the soil, drainage determines the color of the soil. Water and air move freely through well drained soils but slowly through very poorly drained soils. In Miami and other well drained, well aerated soils, the iron compounds that give most soils their color are brightly colored and oxidized. Treaty and other poorly aerated, very poorly drained soils are dull gray and mottled.

Time

Usually, a long time is needed for the processes of soil formation to form distinct soil horizons. Differences in the length of time that the parent material has been in place are commonly reflected in the degree of profile development. Some soils form rapidly. Others form slowly.

The soils in Randolph County range from young to mature. The glacial deposits in which Glynwood and many of the other soils in the county formed have been exposed to the soil-forming processes long enough for the development of distinct horizons. Some soils, however, have not been in place long enough for distinct horizons to develop. Examples are the Allison Variant and other soils that formed in recent alluvial sediments.

Processes of Soil Formation

Several processes have been involved in the formation of the soils in Randolph County. These processes are the accumulation of organic matter; the dissolution, transfer, and removal of calcium carbonates and bases; the liberation and translocation of silicate clay minerals; and the reduction and transfer of iron. In most soils more than one of these processes have helped to differentiate horizons.

Some organic matter has accumulated in the surface layer of all the soils in the county. The organic matter content of some soils is low, but that of others is high. Generally, the soils that have the most organic matter, such as Patton and Treaty soils, have a thick, dark surface soil.

Carbonates and bases have been leached from the upper horizons of nearly all the soils in the county. Leaching probably preceded the translocation of silicate clay minerals. Most of the carbonates and some of the bases have been leached from the A and B horizons of well drained soils. Even in the wettest soils, some leaching is indicated by the absence of carbonates and by an acid reaction. Leaching of wet soils is slow because of a high water table or the slow movement of water through the profile.

Clay accumulates in pores and other voids and forms films on the surfaces along which water moves. The leaching of bases and the translocation of silicate clay minerals are among the more important processes of horizon differentiation in the county. Miami soils are an example of soils in which translocated silicate clay minerals in the form of clay films have accumulated in the Bt horizon.

Gleying, or the reduction and transfer of iron, has occurred in all of the very poorly drained to somewhat poorly drained soils in the county. In the naturally wet soils, this process has significantly affected horizon differentiation. A grayish color in the subsoil indicates the removal of iron oxides. Reduction is commonly accompanied by some transfer of iron, either from upper horizons to lower ones or completely out of the profile. Mottles, which are in some horizons, indicate the segregation of iron.

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material).

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multipled by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters).

Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-78 at Winchester, Indiana)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	33.1	15.9	24.5	61	-13	27	2.36	1.27	3.31	6	4.9
February---	36.3	18.5	27.4	63	-9	23	1.98	.85	2.94	5	4.2
March------	46.3	27.3	36.9	76	3	106	3.24	1.85	4.46	8	4.7
April------	60.0	38.7	49.4	83	20	296	4.07	2.19	5.71	9	.7
May--------	70.7	49.0	59.9	89	29	617	3.82	2.44	5.06	9	.0
June-------	80.1	58.5	69.3	94	42	879	4.09	2.06	5.86	7	.0
July-------	83.6	61.8	72.7	95	47	1,014	3.59	1.92	5.05	7	.0
August-----	82.2	59.3	70.8	94	43	955	3.10	1.69	4.33	6	.0
September--	76.4	52.4	64.4	93	33	732	2.79	.83	4.38	5	.0
October----	64.8	41.4	53.2	84	23	416	2.54	.83	3.93	6	.0
November---	49.5	31.4	40.5	76	8	109	2.84	1.61	3.93	7	1.6
December---	37.3	21.6	29.5	65	-7	34	2.80	.95	4.31	7	5.4
Yearly:											
Average--	60.0	39.7	49.9	---	---	---	---	---	---	---	---
Extreme--	---	---	---	98	-14	---	---	---	---	---	---
Total----	---	---	---	---	---	5,208	37.22	31.50	42.68	82	21.5

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-78 at Winchester, Indiana)

Probability	Temperature		
	24^{o} F or lower	28^{o} F or lower	32^{o} F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 18	Apr. 29	May 16
2 years in 10 later than--	Apr. 13	Apr. 24	May 11
5 years in 10 later than--	Apr. 3	Apr. 16	May 2
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 19	Oct. 12	Sept. 27
2 years in 10 earlier than--	Oct. 24	Oct. 17	Oct. 2
5 years in 10 earlier than--	Nov. 4	Oct. 26	Oct. 11

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-78 at Winchester, Indiana)

Probability	Daily minimum temperature during growing season		
	Higher than 24^{o} F	Higher than 28^{o} F	Higher than 32^{o} F
	Days	Days	Days
9 years in 10	192	174	142
8 years in 10	200	180	149
5 years in 10	214	192	161
2 years in 10	228	205	174
1 year in 10	235	211	180

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
An	Allison Variant silty clay, frequently flooded	1,900	0.7
BlA	Blount silt loam, 0 to 1 percent slopes	18,000	6.2
Ca	Carlisle muck, undrained	630	0.2
CeB	Celina silt loam, 1 to 4 percent slopes	21,000	7.2
CkB	Celina silt loam, stony subsoil, 1 to 4 percent slopes	3,970	1.4
CnB	Crosby silt loam, stony subsoil, 1 to 3 percent slopes	9,336	3.2
Ee	Eel silt loam, frequently flooded	5,981	2.1
EnA	Eldean Variant loam, 0 to 2 percent slopes	1,250	0.4
FcA	Fincastle-Crosby silt loams, 0 to 1 percent slopes	25,866	8.9
FoA	Fox loam, 0 to 2 percent slopes	1,500	0.5
FoB	Fox loam, 2 to 6 percent slopes	1,750	0.6
FxC3	Fox clay loam, 6 to 12 percent slopes, severely eroded	550	0.2
GnB2	Glynwood silt loam, 1 to 4 percent slopes, eroded	40,010	13.8
LnB2	Losantville silt loam, 2 to 6 percent slopes, eroded	11,332	3.9
LnE	Losantville loam, 18 to 25 percent slopes	275	0.1
LoC3	Losantville clay loam, 6 to 12 percent slopes, severely eroded	4,100	1.4
LoD3	Losantville clay loam, 12 to 18 percent slopes, severely eroded	650	0.2
LsB2	Losantville silt loam, stony subsoil, 2 to 6 percent slopes, eroded	10,750	3.7
LtC3	Losantville clay loam, stony subsoil, 6 to 12 percent slopes, severely eroded	4,000	1.4
LtD3	Losantville clay loam, stony subsoil, 12 to 18 percent slopes, severely eroded	350	0.1
Lw	Linwood muck, undrained	325	0.1
MoA	Miami silt loam, gravelly substratum, 0 to 2 percent slopes	2,400	0.8
MoB2	Miami silt loam, gravelly substratum, 2 to 6 percent slopes, eroded	6,250	2.2
MuB	Morley silt loam, 3 to 6 percent slopes	10,800	3.7
MyC3	Morley clay loam, 6 to 12 percent slopes, severely eroded	3,600	1.2
Pn	Patton silty clay loam	35,927	12.4
Pw	Pewamo silty clay loam	41,268	14.2
Px	Pewamo silt loam, overwash	1,500	0.5
Sa	Saranac silty clay, frequently flooded	2,000	0.7
Sm	Sleeth loam	1,350	0.5
So	Sloan silt loam, frequently flooded	4,450	1.5
Tr	Treaty silt loam	11,545	4.0
Ts	Treaty silt loam, stony subsoil	3,238	1.1
Ud	Udorthents, loamy	450	0.2
Wa	Wallkill silt loam, undrained	900	0.3
Wo	Westland clay loam, limestone substratum	450	0.2
	Water less than 40 acres in size	600	0.2
	Total	290,253	100.0

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
An	Allison Variant silty clay, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
BlA	Blount silt loam, 0 to 1 percent slopes (where drained)
CeB	Celina silt loam, 1 to 4 percent slopes
CkB	Celina silt loam, stony subsoil, 1 to 4 percent slopes
CnB	Crosby silt loam, stony subsoil, 1 to 3 percent slopes (where drained)
Ee	Eel silt loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
EnA	Eldean Variant loam, 0 to 2 percent slopes
FcA	Fincastle-Crosby silt loams, 0 to 1 percent slopes (where drained)
FoA	Fox loam, 0 to 2 percent slopes
FoB	Fox loam, 2 to 6 percent slopes
GnB2	Glynwood silt loam, 1 to 4 percent slopes, eroded
LnB2	Losantville silt loam, 2 to 6 percent slopes, eroded
LsB2	Losantville silt loam, stony subsoil, 2 to 6 percent slopes, eroded
MoA	Miami silt loam, gravelly substratum, 0 to 2 percent slopes
MoB2	Miami silt loam, gravelly substratum, 2 to 6 percent slopes, eroded
MuB	Morley silt loam, 3 to 6 percent slopes
Pn	Patton silty clay loam (where drained)
Pw	Pewamo silty clay loam (where drained)
Px	Pewamo silt loam, overwash (where drained)
Sa	Saranac silty clay, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
Sm	Sleeth loam (where drained)
So	Sloan silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
Tr	Treaty silt loam (where drained)
Ts	Treaty silt loam, stony subsoil (where drained)
Wo	Westland clay loam, limestone substratum (where drained)

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Bromegrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
An----------------------- Allison Variant	IIIw	85	30	34	3.5	7.0
BlA---------------------- Blount	IIw	106	35	48	4.3	7.2
Ca----------------------- Carlisle	Vw	---	---	---	---	---
CeB, CkB----------------- Celina	IIe	105	40	45	4.5	9.0
CnB---------------------- Crosby	IIw	90	32	40	3.0	6.0
Ee----------------------- Eel	IIw	105	37	---	3.5	8.0
EnA---------------------- Eldean Variant	IIs	95	35	42	3.3	6.6
FcA---------------------- Fincastle-Crosby	IIw	122	44	52	3.9	7.9
FoA---------------------- Fox	IIs	95	32	45	4.5	9.0
FoB---------------------- Fox	IIe	95	30	42	4.5	9.0
FxC3--------------------- Fox	IVe	70	---	30	3.8	7.6
GnB2--------------------- Glynwood	IIIe	95	30	35	4.0	8.0
LnB2--------------------- Losantville	IIe	90	36	42	3.7	7.4
LnE---------------------- Losantville	VIe	---	---	---	---	5.2
LoC3--------------------- Losantville	IVe	60	24	28	2.6	5.2
LoD3--------------------- Losantville	VIe	---	---	---	2.6	5.2
LsB2--------------------- Losantville	IIe	90	36	42	3.7	7.4
LtC3--------------------- Losantville	IVe	60	24	28	2.6	5.2
LtD3--------------------- Losantville	VIe	---	---	---	2.6	5.2

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Bromegrass-alfalfa hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
Lw----------------------- Linwood	Vw	---	---	---	---	---
MoA---------------------- Miami	I	105	40	45	5.0	9.0
MoB2--------------------- Miami	IIe	90	35	40	4.5	9.0
MuB---------------------- Morley	IIe	102	35	47	4.3	8.6
MyC3--------------------- Morley	IVe	90	31	39	3.6	7.2
Pn----------------------- Patton	IIw	148	48	56	5.6	11.2
Pw, Px------------------- Pewamo	IIw	125	42	60	5.0	10.0
Sa----------------------- Saranac	IIIw	95	35	45	3.1	6.2
Sm----------------------- Sleeth	IIw	120	42	48	4.0	8.0
So----------------------- Sloan	IIIw	110	35	---	4.0	8.0
Tr, Ts------------------- Treaty	IIw	150	52	65	4.8	9.6
Ud**. Udorthents						
Wa----------------------- Wallkill	Vw	---	---	---	---	---
Wo----------------------- Westland	IIw	120	40	45	4.0	8.2

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

(Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	2,400	---	---	---	---
II	223,063	65,852	154,461	2,750	---
III	48,360	40,010	8,350	---	---
IV	12,250	12,250	---	---	---
V	1,855	---	1,855	---	---
VI	1,275	1,275	---	---	---
VII	---	---	---	---	---
VIII	---	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
An------------ Allison Variant	8A	Slight	Slight	Slight	Slight	Yellow-poplar-------	100	107	Black walnut, white oak, yellow-poplar, northern red oak, white ash, green ash, eastern white pine, red pine, black cherry, American sycamore, eastern cottonwood.
						White oak-----------	90	72	
						Black walnut--------	70	---	
BlA------------ Blount	3C	Slight	Slight	Severe	Severe	White oak-----------	65	48	Eastern white pine, eastern redcedar, red pine, yellow-poplar.
						Northern red oak----	65	48	
						Green ash-----------	---	---	
						Bur oak-------------	---	---	
						Pin oak-------------	---	---	
Ca------------- Carlisle	6W	Slight	Severe	Severe	Severe	Eastern cottonwood--	80	78	Eastern cottonwood, green ash, black willow.
						White ash-----------	---	---	
						Green ash-----------	---	---	
						Black cherry--------	---	---	
						Swamp white oak-----	---	---	
						Red maple-----------	---	---	
CeB, CkB-------- Celina	5A	Slight	Slight	Slight	Slight	Northern red oak----	90	72	Eastern white pine, black walnut, red pine, yellow-poplar, white ash, northern red oak, white oak.
						Yellow-poplar-------	110	124	
						White oak-----------	---	---	
						Black walnut--------	---	---	
						Black cherry--------	---	---	
						Sugar maple---------	---	---	
						White ash-----------	---	---	
CnB------------ Crosby	4A	Slight	Slight	Slight	Slight	White oak-----------	75	57	Eastern white pine, northern red oak, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak-------------	85	67	
						Yellow-poplar-------	85	81	
						Northern red oak----	75	57	
Ee------------- Eel	8A	Slight	Slight	Slight	Slight	Yellow-poplar-------	100	107	Eastern white pine, black walnut, yellow-poplar.
						Eastern cottonwood--	---	---	
						White ash-----------	---	---	
						Black walnut--------	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
EnA------------- Eldean Variant	5A	Slight	Slight	Slight	Slight	White oak-----------	90	72	Black walnut, white oak, yellow-poplar, northern red oak, white ash, green ash, eastern white pine, red pine, black cherry, American sycamore, eastern cottonwood.
						Yellow-poplar-------	98	104	
						White ash-----------	---	---	
FcA**:									
Fincastle------	4A	Slight	Slight	Slight	Slight	Northern red oak----	75	57	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						White oak-----------	75	57	
						Pin oak-------------	85	67	
						Yellow-poplar-------	85	81	
						Sweetgum------------	80	6	
Crosby---------	4A	Slight	Slight	Slight	Slight	White oak-----------	75	57	Eastern white pine, northern red oak, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak-------------	85	67	
						Yellow-poplar-------	81	81	
						Northern red oak----	75	57	
FoA, FoB, FxC3-- Fox	4A	Slight	Slight	Slight	Slight	Northern red oak----	80	62	Yellow-poplar, white ash, eastern white pine, red pine.
						White oak-----------	---	---	
						Sugar maple---------	---	---	
GnB2------------ Glynwood	4C	Slight	Slight	Moderate	Moderate	Northern red oak----	80	62	Austrian pine, yellow-poplar, green ash, pin oak, red maple, black oak, American sycamore, eastern cottonwood.
						Black oak-----------	80	62	
						White oak-----------	80	62	
						Red maple-----------	---	---	
						Slippery elm--------	---	---	
						Black cherry--------	---	---	
						White ash-----------	---	---	
LnB2------------ Losantville	4A	Slight	Slight	Slight	Slight	White oak-----------	75	57	Eastern white pine, yellow-poplar, black walnut.
						Northern red oak----	80	62	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume*	Trees to plant
LnE------------- Losantville	4R	Moderate	Moderate	Slight	Slight	White oak----------- Northern red oak----	75 80	57 62	Eastern white pine, yellow-poplar, black walnut.
LoC3------------ Losantville	4A	Slight	Slight	Slight	Slight	White oak----------- Northern red oak----	75 80	57 62	Eastern white pine, yellow-poplar, black walnut.
LoD3------------ Losantville	4R	Moderate	Moderate	Slight	Slight	White oak----------- Northern red oak----	75 80	57 62	Eastern white pine, yellow-poplar, black walnut.
LsB2, LtC3------ Losantville	4A	Slight	Slight	Slight	Slight	White oak----------- Northern red oak----	75 80	57 62	Eastern white pine, yellow-poplar, black walnut.
LtD3------------ Losantville	4R	Moderate	Moderate	Slight	Slight	White oak----------- Northern red oak----	75 80	57 62	Eastern white pine, yellow-poplar, black walnut.
Lw-------------- Linwood	2W	Slight	Severe	Severe	Severe	Red maple----------- Eastern cottonwood-- American sycamore--- Green ash----------- Pin oak-------------	46 --- --- --- ---	30 --- --- --- ---	Red maple, green ash, American sycamore, eastern cottonwood, pin oak, swamp white oak.
MoA, MoB2------- Miami	5A	Slight	Slight	Slight	Slight	White oak----------- Yellow-poplar------- Sweetgum------------	90 98 76	72 104 70	Yellow-poplar, white ash, black walnut, red pine, white oak.
MuB, MyC3------- Morley	4A	Slight	Slight	Slight	Slight	White oak----------- Northern red oak---- Yellow-poplar------- Black walnut-------- Bur oak------------- Shagbark hickory----	80 80 90 --- --- ---	62 62 90 --- --- ---	White oak, black walnut, green ash, eastern white pine, red pine, white spruce.
Pn-------------- Patton	5W	Slight	Severe	Moderate	Moderate	Pin oak------------- White oak----------- Sweetgum------------ Northern red oak----	85 75 80 75	67 57 79 57	Eastern white pine, red maple, white ash.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
Pw, Px: Pewamo	5W	Slight	Severe	Moderate	Moderate	Pin oak	90	72	White ash, eastern white pine, red maple, green ash.
						Swamp white oak	---	---	
						Red maple	71	44	
						White ash	71	77	
						Eastern cottonwood	98	123	
						Green ash	---	---	
Sa: Saranac	4W	Slight	Severe	Severe	Severe	Pin oak	85	67	Eastern white pine, red maple, white ash.
						Red maple	---	---	
						Bur oak	---	---	
						White ash	---	---	
						Sweetgum	---	---	
Sm: Sleeth	5A	Slight	Slight	Slight	Slight	Pin oak	85	67	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						Yellow-poplar	85	81	
						Sweetgum	80	79	
						White oak	70	52	
So: Sloan	4W	Slight	Severe	Severe	Severe	Pin oak	86	68	Red maple, green ash, eastern cottonwood, pin oak, swamp white oak, silver maple, American sycamore.
						Swamp white oak	---	---	
						Red maple	---	---	
						Green ash	---	---	
						Eastern cottonwood	---	---	
Tr, Ts: Treaty	5W	Slight	Severe	Severe	Severe	Pin oak	90	72	Eastern white pine, red maple, white ash.
						White oak	75	57	
						Sweetgum	90	106	
						Northern red oak	---	---	
Wa: Wallkill	3W	Slight	Severe	Severe	Severe	Pin oak	65	48	Red maple, green ash, eastern cottonwood, pin oak.
						Red maple	51	32	
						White ash	52	30	
						Quaking aspen	56	56	
Wo: Westland	2W	Slight	Severe	Severe	Severe	Pin oak	36	24	American sycamore, eastern cottonwood, green ash, pin oak, red maple, swamp white oak.
						Norway spruce	25	---	

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
An: Allison Variant	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, northern white-cedar, white fir, Washington hawthorn, blue spruce.	Norway spruce	Eastern white pine, pin oak.
BlA: Blount	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, arrowwood, Amur privet, Washington hawthorn, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
Ca. Carlisle					
CeB, CkB: Celina	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, white fir, blue spruce, Washington hawthorn, Austrian pine.	Norway spruce	Pin oak, eastern white pine.
CnB: Crosby	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Pin oak, eastern white pine.
Ee: Eel	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
EnA: Eldean Variant	Siberian peashrub	Eastern redcedar, radiant crabapple, autumn-olive, Washington hawthorn, lilac, Amur honeysuckle, Tatarian honeysuckle.	Eastern white pine, red pine, jack pine, Austrian pine.	---	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
FcA*:					
Fincastle	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Crosby	---	Arrowwood, eastern redcedar, Washington hawthorn, Amur honeysuckle, American cranberrybush, Amur privet, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
FoA, FoB, FxC3 Fox	Siberian peashrub	Autumn-olive, Amur honeysuckle, eastern redcedar, radiant crabapple, Washington hawthorn, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
GnB2 Glynwood	---	Amur honeysuckle, Washington hawthorn, Amur privet, arrowwood, eastern redcedar, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Pin oak, eastern white pine.	---
LnB2, LnE, LoC3, LoD3, LsB2, LtC3, LtD3 Losantville	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	Washington hawthorn, white fir, blue spruce, northern white-cedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Lw Linwood	Common ninebark, whitebelle honeysuckle.	Amur privet, nannyberry viburnum, Amur honeysuckle, Tatarian honeysuckle, silky dogwood.	Tall purple willow	Golden willow, black willow.	Imperial Carolina poplar.
MoA, MoB2 Miami	---	Amur privet, silky dogwood, American cranberrybush, Amur honeysuckle.	Northern white-cedar, Washington hawthorn, blue spruce, Austrian pine, white fir.	Norway spruce	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
MuB, MyC3: Morley	---	Amur honeysuckle, Washington hawthorn, eastern redcedar, Amur privet, arrowwood, American cranberrybush, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Pn: Patton	---	Amur privet, silky dogwood, American cranberrybush, Amur honeysuckle.	White fir, northern white-cedar, blue spruce, Austrian pine, Washington hawthorn, Norway spruce.	Eastern white pine	Pin oak.
Pw, Px: Pewamo	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Sa: Saranac	---	American cranberrybush, Amur privet, Amur honeysuckle, silky dogwood.	Northern white-cedar, Washington hawthorn, white fir, blue spruce, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
Sm: Sleeth	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
So: Sloan	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Tr, Ts: Treaty	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Ud*. Udorthents					

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Wa: Wallkill	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Wo: Westland	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
An----- Allison Variant	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey, flooding.	Severe: too clayey.	Severe: flooding, too clayey.
BlA----- Blount	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Ca----- Carlisle	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
CeB, CkB----- Celina	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Slight.
CnB----- Crosby	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Ee----- Eel	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
EnA----- Eldean Variant	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight-----	Moderate: droughty.
FcA*:					
Fincastle-----	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Crosby-----	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
FoA, FoB----- Fox	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight-----	Moderate: small stones.
FxC3----- Fox	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight-----	Moderate: slope, small stones.
GnB2----- Glynwood	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: wetness, slope, percs slowly.	Moderate: wetness.	Slight.
LnB2----- Losantville	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight-----	Moderate: droughty.
LnE----- Losantville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
LoC3: Losantville	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: droughty, slope.
LoD3: Losantville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
LsB2: Losantville	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Moderate: droughty.
LtC3: Losantville	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: droughty, slope.
LtD3: Losantville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Lw: Linwood	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
MoA: Miami	Slight	Slight	Slight	Slight	Slight.
MoB2: Miami	Slight	Slight	Moderate: slope.	Slight	Slight.
MuB: Morley	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
MyC3: Morley	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Pn: Patton	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Pw, Px: Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Sa: Saranac	Severe: flooding, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness, flooding.	Severe: wetness, too clayey.	Severe: wetness, flooding, too clayey.
Sm: Sleeth	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
So: Sloan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Tr, Ts: Treaty	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Ud*. Udorthents					

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Wa: Wallkill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, erodes easily.	Severe: ponding.
Wo: Westland	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
An------------------ Allison Variant	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
BlA----------------- Blount	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ca------------------ Carlisle	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
CeB, CkB------------ Celina	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CnB----------------- Crosby	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ee------------------ Eel	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
EnA----------------- Eldean Variant	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
FcA*:										
Fincastle-----------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Crosby--------------	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
FoA, FoB, FxC3------ Fox	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
GnB2---------------- Glynwood	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
LnB2---------------- Losantville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LnE----------------- Losantville	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
LoC3---------------- Losantville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
LoD3---------------- Losantville	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
LsB2---------------- Losantville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LtC3---------------- Losantville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
LtD3---------------- Losantville	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Lw------------------ Linwood	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
MoA, MoB2: Miami	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MuB: Morley	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
MyC3: Morley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Pn: Patton	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
Pw, Px: Pewamo	Good	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
Sa: Saranac	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Sm: Sleeth	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
So: Sloan	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
Tr, Ts: Treaty	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Ud*. Udorthents										
Wa: Wallkill	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Wo: Westland	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
An: Allison Variant	Moderate: too clayey, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Severe: flooding, too clayey.
BlA: Blount	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Ca: Carlisle	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
CeB, CkB: Celina	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
CnB: Crosby	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Ee: Eel	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.
EnA: Eldean Variant	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
FcA*:						
Fincastle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Crosby	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
FoA: Fox	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Moderate: small stones.
FoB: Fox	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Moderate: small stones.
FxC3: Fox	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope, small stones.
GnB2: Glynwood	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: frost action, low strength.	Slight.
LnB2: Losantville	Moderate: wetness.	Slight	Moderate: wetness.	Moderate: slope.	Moderate: frost action.	Moderate: droughty.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
LnE Losantville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
LoC3 Losantville	Moderate: wetness, slope.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
LoD3 Losantville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
LsB2 Losantville	Moderate: wetness.	Slight	Moderate: wetness.	Moderate: slope.	Moderate: frost action.	Moderate: droughty.
LtC3 Losantville	Moderate: wetness, slope.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
LtD3 Losantville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lw Linwood	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action, subsides.	Severe: ponding, excess humus.
MoA Miami	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
MoB2 Miami	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
MuB Morley	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
MyC3 Morley	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Pn Patton	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Pw, Px Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Sa Saranac	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding, too clayey.
Sm Sleeth	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
So: Sloan	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Tr, Ts: Treaty	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Ud*. Udorthents						
Wa: Wallkill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
Wo: Westland	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
An: Allison Variant	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey.
BlA: Blount	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ca: Carlisle	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
CeB, CkB: Celina	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey.
CnB: Crosby	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ee: Eel	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
EnA: Eldean Variant	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
FcA*:					
Fincastle	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Crosby	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
FoA, FoB: Fox	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
FxC3: Fox	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
GnB2: Glynwood	Severe: percs slowly, wetness.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
LnB2: Losantville	Severe: percs slowly.	Moderate: seepage, slope, wetness.	Slight	Slight	Good.
LnE: Losantville	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
LoC3: Losantville	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
LoD3: Losantville	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
LsB2: Losantville	Severe: percs slowly.	Moderate: seepage, slope, wetness.	Slight	Slight	Good.
LtC3: Losantville	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
LtD3: Losantville	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Lw: Linwood	Severe: ponding.	Severe: seepage, excess humus, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
MoA, MoB2: Miami	Moderate: percs slowly.	Moderate: seepage.	Severe: seepage.	Slight	Fair: too clayey, thin layer.
MuB: Morley	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
MyC3: Morley	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Pn: Patton	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Pw, Px: Pewamo	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, ponding, hard to pack.
Sa: Saranac	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Sm: Sleeth	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
So------------------ Sloan	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Tr, Ts-------------- Treaty	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Ud*. Udorthents					
Wa------------------ Wallkill	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Poor: ponding.
Wo------------------ Westland	Severe: ponding.	Severe: ponding.	Severe: depth to rock, ponding.	Severe: ponding.	Poor: ponding, thin layer.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
An: Allison Variant	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BlA: Blount	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ca: Carlisle	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
CeB, CkB: Celina	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
CnB: Crosby	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Ee: Eel	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
EnA: Eldean Variant	Good	Probable	Probable	Poor: small stones, area reclaim.
FcA*:				
Fincastle	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Crosby	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
FoA, FoB, FxC3: Fox	Good	Probable	Probable	Poor: small stones, area reclaim.
GnB2: Glynwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
LnB2: Losantville	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
LnE: Losantville	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
LoC3: Losantville	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
LoD3: Losantville	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
LsB2, LtC3: Losantville	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
LtD3------------------ Losantville	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Lw-------------------- Linwood	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
MoA, MoB2------------- Miami	Good-----------------	Probable-------------	Probable-------------	Fair: small stones, area reclaim.
MuB, MyC3------------- Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Pn-------------------- Patton	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Pw, Px---------------- Pewamo	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Sa-------------------- Saranac	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Sm-------------------- Sleeth	Fair: wetness.	Probable-------------	Probable-------------	Poor: area reclaim.
So-------------------- Sloan	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Tr, Ts---------------- Treaty	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ud*. Udorthents				
Wa-------------------- Wallkill	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Wo-------------------- Westland	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
An----------------- Allison Variant	Slight----------	Severe: no water.	Deep to water	Slow intake, flooding.	Favorable------	Favorable.
BlA---------------- Blount	Slight----------	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily.
Ca----------------- Carlisle	Severe: seepage.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
CeB, CkB----------- Celina	Slight----------	Severe: no water.	Frost action---	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
CnB---------------- Crosby	Slight----------	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, rooting depth.
Ee----------------- Eel	Moderate: seepage.	Moderate: slow refill.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Erodes easily.
EnA---------------- Eldean Variant	Severe: seepage.	Severe: no water.	Deep to water	Droughty, rooting depth.	Too sandy------	Droughty, rooting depth.
FcA*:						
Fincastle---------	Moderate: seepage.	Severe: slow refill.	Frost action---	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
Crosby------------	Slight----------	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily, rooting depth.
FoA---------------- Fox	Severe: seepage.	Severe: no water.	Deep to water	Erodes easily	Too sandy------	Erodes easily.
FoB---------------- Fox	Severe: seepage.	Severe: no water.	Deep to water	Slope, erodes easily.	Too sandy------	Erodes easily.
FxC3--------------- Fox	Severe: seepage, slope.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, too sandy.	Slope, erodes easily.
GnB2--------------- Glynwood	Slight----------	Severe: no water.	Percs slowly, frost action.	Percs slowly, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily, rooting depth.
LnB2--------------- Losantville	Moderate: slope.	Severe: no water.	Deep to water	Droughty, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, droughty.
LnE, LoC3, LoD3--- Losantville	Severe: slope.	Severe: no water.	Deep to water	Droughty, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, droughty.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
LsB2 Losantville	Moderate: slope.	Severe: no water.	Deep to water	Droughty, percs slowly, rooting depth.	Erodes easily, percs slowly.	Erodes easily, droughty.
LtC3, LtD3 Losantville	Severe: slope.	Severe: no water.	Deep to water	Droughty, percs slowly, rooting depth.	Slope, erodes easily, percs slowly.	Slope, erodes easily, droughty.
Lw Linwood	Severe: seepage.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing, rooting depth.	Ponding, soil blowing.	Wetness, rooting depth.
MoA Miami	Moderate: seepage.	Severe: no water.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
MoB2 Miami	Moderate: seepage, slope.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
MuB Morley	Moderate: slope.	Severe: no water.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
MyC3 Morley	Severe: slope.	Severe: no water.	Deep to water	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Pn Patton	Slight	Severe: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
Pw, Px Pewamo	Slight	Severe: slow refill.	Ponding, frost action.	Ponding	Ponding	Wetness.
Sa Saranac	Slight	Severe: slow refill.	Percs slowly, flooding, frost action.	Wetness, slow intake, percs slowly.	Wetness	Wetness, rooting depth, percs slowly.
Sm Sleeth	Severe: seepage.	Severe: cutbanks cave.	Frost action	Wetness	Wetness	Wetness.
So Sloan	Moderate: seepage.	Severe: slow refill.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
Tr, Ts Treaty	Moderate: seepage.	Severe: slow refill.	Ponding, frost action.	Ponding	Ponding, erodes easily.	Wetness, erodes easily.
Ud*. Udorthents						
Wa Wallkill	Severe: seepage.	Moderate: slow refill.	Ponding, frost action.	Ponding, erodes easily.	Erodes easily, ponding.	Wetness, erodes easily.
Wo Westland	Moderate: seepage, depth to rock.	Severe: cutbanks cave.	Ponding, frost action.	Ponding	Ponding	Wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
An--------------- Allison Variant	0-18	Silty clay-------	CL	A-7	0	100	100	95-100	90-95	40-50	15-25
	18-42	Silty clay, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-50	15-25
	42-60	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	70-80	35-45	10-20
BlA-------------- Blount	0-12	Silt loam--------	CL	A-6, A-4	0-5	95-100	95-100	90-100	80-95	25-40	8-20
	12-31	Silty clay loam, silty clay, clay loam.	CH, CL	A-7, A-6	0-5	95-100	90-100	80-90	75-85	35-60	15-35
	31-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	90-100	90-100	80-100	70-90	30-45	10-25
Ca--------------- Carlisle	0-60	Sapric material	PT	A-8	---	---	---	---	---	---	---
CeB-------------- Celina	0-17	Silt loam--------	ML	A-4	0	100	90-100	90-100	70-85	26-40	3-10
	17-32	Clay, silty clay, silty clay loam.	CL	A-6, A-7	0	100	90-100	80-95	70-85	32-48	12-28
	32-60	Loam, silt loam	CL, CL-ML	A-4, A-6	0	75-95	75-90	65-90	50-80	20-36	4-16
CkB-------------- Celina	0-11	Silt loam--------	ML	A-4	0	100	90-100	90-100	70-85	26-40	3-10
	11-29	Clay, clay loam, silty clay loam.	CL	A-6, A-7	0-10	75-95	75-90	65-90	50-80	32-48	12-28
	29-60	Loam, silt loam	CL, CL-ML	A-4, A-6	0-10	75-95	75-90	65-90	50-80	20-36	4-16
CnB-------------- Crosby	0-13	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	95-100	85-100	65-90	20-35	5-15
	13-26	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	85-95	80-90	65-90	50-70	35-45	15-20
	26-60	Loam-------------	CL-ML, CL	A-4, A-6	0-10	85-95	80-90	65-90	50-70	20-35	5-15
Ee--------------- Eel	0-10	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	75-85	24-40	3-15
	10-34	Silt loam, loam	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	75-85	24-40	3-15
	34-60	Stratified sandy loam to silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	100	90-100	70-80	55-70	24-40	3-15
EnA-------------- Eldean Variant	0-8	Loam-------------	CL	A-6, A-4	0	95-100	95-100	85-95	60-75	25-35	8-15
	8-20	Gravelly clay, clay loam.	CL	A-7, A-6	0	75-100	75-80	65-75	50-60	35-50	15-25
	20-25	Very gravelly coarse sandy loam.	SM-SC, GM-GC, GC, SC	A-2, A-1	0-5	40-75	35-60	20-45	12-25	20-40	4-15
	25-60	Very gravelly loamy coarse sand, gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	0-5	25-55	20-50	10-30	3-12	<25	NP-4
FcA*: Fincastle-------	0-12	Silt loam--------	CL, ML, CL-ML	A-4	0	100	95-100	90-100	75-93	<25	3-10
	12-45	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	85-95	30-40	10-15
	45-60	Loam-------------	CL	A-4, A-6	0-3	88-96	82-90	70-86	50-66	25-30	8-11

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
FcA*:											
Crosby----------	0-11	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0	100	95-100	80-100	50-90	15-30	4-15
	11-22	Clay loam, silty clay loam, clay.	CL	A-6, A-7	0-3	90-100	85-100	75-95	65-95	35-50	15-25
	22-60	Loam-------------	CL, ML, CL-ML	A-4, A-6	0-3	85-100	80-95	75-90	50-65	15-30	4-15
FoA, FoB--------- Fox	0-11	Loam-------------	ML, CL, SM, SC	A-4	0	70-100	65-100	60-95	45-90	<25	3-8
	11-27	Silty clay loam, silt loam, clay loam.	CL, SC, GC	A-2, A-6, A-7	0	65-100	55-100	40-100	30-95	22-50	10-25
	27-35	Clay loam, loam, sandy clay loam.	CL, SC, GC	A-2, A-6, A-7	0-5	65-100	55-100	30-100	15-80	22-45	10-25
	35-60	Sand and gravel, sand, coarse sand.	SP, GP, SP-SM, GP-GM	A-1, A-2, A-3	0-10	30-100	30-100	10-95	2-10	---	NP
FxC3------------- Fox	0-7	Clay loam--------	CL, SC	A-2, A-4, A-6	0	70-100	65-100	60-100	25-95	25-40	9-20
	7-20	Sandy clay loam, silt loam, clay loam.	CL, SC, GC	A-2, A-6, A-7	0	65-100	55-100	40-100	30-95	22-50	10-25
	20-31	Clay loam, sandy loam, sandy clay loam.	CL, SC, GC	A-2, A-6, A-7	0-5	65-100	55-100	30-100	15-80	22-45	10-25
	31-60	Sand and gravel, sand, coarse sand.	SP, GP, SP-SM, GP-GM	A-1, A-2, A-3	0-10	30-100	30-100	10-95	2-10	---	NP
GnB2------------- Glynwood	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	95-100	90-100	80-100	55-90	23-40	4-15
	8-26	Clay, clay loam, silty clay loam.	CL, CH	A-7, A-6	0-5	95-100	85-100	75-100	65-95	35-55	15-30
	26-60	Clay loam, silty clay loam.	CL	A-6, A-4	0-5	95-100	80-100	75-95	65-90	25-40	7-18
LnB2, LnE-------- Losantville	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0-2	95-100	90-100	80-100	65-90	20-30	5-12
	10-23	Clay, clay loam	CL	A-7, A-6	0-2	90-100	85-100	75-95	60-90	35-50	15-25
	23-60	Loam-------------	CL, CL-ML	A-4	0-5	85-95	80-95	65-85	50-70	20-30	5-10
LoC3, LoD3------- Losantville	0-8	Clay loam--------	CL	A-6	0-2	95-100	90-100	80-100	65-80	30-40	11-20
	8-22	Clay, clay loam	CL	A-7, A-6	0-2	90-100	85-100	75-95	60-90	35-50	15-25
	22-60	Loam-------------	CL, CL-ML	A-4	0-5	85-95	80-95	65-85	50-70	20-30	5-10
LsB2------------- Losantville	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0-2	95-100	90-100	80-100	65-90	20-30	5-12
	6-18	Silty clay loam, clay loam.	CL	A-7, A-6	0-10	85-95	80-90	65-85	50-70	35-50	15-25
	18-60	Loam-------------	CL, CL-ML	A-4	0-10	85-95	80-90	65-85	50-70	20-30	5-10
LtC3, LtD3------- Losantville	0-4	Clay loam--------	CL	A-6	0-2	95-100	90-100	80-100	65-80	30-40	11-20
	4-11	Clay, clay loam	CL	A-7, A-6	0-10	85-95	80-90	65-85	50-70	35-50	15-25
	11-60	Loam-------------	CL, CL-ML	A-4	0-10	85-95	80-90	65-85	50-70	20-30	5-10

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Lw---------------- Linwood	0-18	Sapric material	PT	A-8	0	---	---	---	---	---	---
	18-60	Clay loam, sandy loam, silty clay loam.	CL, ML, SM, SC	A-4, A-6	0	100	95-100	60-100	35-95	15-40	NP-20
MoA, MoB2--------- Miami	0-10	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	95-100	85-100	70-90	20-30	6-15
	10-32	Silty clay loam, clay loam, silt loam.	CL	A-6	0	100	90-100	80-100	65-95	30-40	10-20
	32-65	Loam, silt loam	CL-ML, CL	A-4, A-6	0	100	90-100	75-100	55-85	20-35	5-15
	65-80	Stratified gravelly sandy clay loam to very gravelly coarse sand.	GP, GP-GM, SP, SP-SM	A-1, A-4	0-3	40-55	30-60	15-80	2-75	<30	NP-10
MuB--------------- Morley	0-8	Silt loam--------	CL, CL-ML	A-6, A-4	0-5	95-100	95-100	90-100	75-95	25-40	5-15
	8-11	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-50	15-30
	11-24	Silty clay, clay loam, clay.	CL, CH	A-7	0-10	95-100	90-100	85-95	80-90	40-60	15-35
	24-32	Silty clay loam, clay loam, silty clay.	CL, CH	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-60	15-30
	32-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-50	15-30
MyC3-------------- Morley	0-8	Clay loam--------	CL	A-6, A-7	0-5	95-100	90-100	85-95	80-90	30-45	15-25
	8-27	Silty clay, clay loam, clay.	CL, CH	A-7	0-10	95-100	90-100	85-95	80-90	40-60	15-35
	27-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-50	15-30
Pn---------------- Patton	0-11	Silty clay loam	CL	A-6	0	100	100	95-100	75-95	30-40	15-25
	11-32	Silty clay loam	CL, CH, ML, MH	A-7	0	100	100	95-100	80-100	40-55	15-25
	32-80	Stratified gravelly sandy loam to silty clay loam.	CL, SC	A-6	0	95-100	75-100	85-100	50-95	25-40	10-20
Pw---------------- Pewamo	0-18	Silty clay loam	CL	A-6, A-7	0-5	90-100	80-100	80-100	70-90	35-50	15-25
	18-46	Clay loam, clay, silty clay.	CL, CH	A-7, A-6	0-5	95-100	90-100	90-100	75-95	35-55	15-30
	46-65	Clay loam, silty clay loam.	CL	A-7	0-5	95-100	90-100	90-100	70-90	40-50	15-25
Px---------------- Pewamo	0-18	Silt loam--------	ML, CL, CL-ML	A-4	0-5	90-100	80-100	80-95	60-85	20-35	3-10
	18-50	Clay loam, clay, silty clay.	CL, CH	A-7, A-6	0-5	95-100	90-100	90-100	75-95	35-55	15-30
	50-60	Clay loam, silty clay loam.	CL	A-7	0-5	95-100	90-100	90-100	70-90	40-50	15-25
Sa---------------- Saranac	0-8	Silty clay-------	CL, CH	A-7	0	100	100	95-100	80-95	45-65	25-40
	8-40	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	100	95-100	90-100	70-90	40-60	20-35
	40-60	Clay loam, silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	90-100	70-90	40-60	20-35

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Sm-------------- Sleeth	0-12	Loam------------	CL, ML, CL-ML	A-4, A-6	0	100	90-100	75-95	50-85	20-35	3-15
	12-50	Loam, silty clay loam, clay loam.	CL	A-6	0	85-95	85-95	80-90	65-75	30-40	15-25
	50-65	Stratified sand to gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	1-5	30-70	22-55	7-20	2-10	---	NP
So-------------- Sloan	0-8	Silt loam--------	CL, ML, CL-ML	A-6, A-4	0	100	95-100	85-100	70-95	20-40	3-15
	8-32	Silty clay loam, clay loam, loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	75-95	30-45	8-18
	32-80	Stratified gravelly sandy loam to silty clay loam.	ML, CL	A-4, A-6	0	95-100	70-100	60-95	50-90	25-40	3-15
Tr-------------- Treaty	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-95	25-40	5-15
	7-32	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	30-40	10-15
	32-45	Clay loam, silty clay loam, silt loam.	CL, CL-ML	A-6, A-4	0	95-100	90-100	75-95	55-85	25-40	5-15
	45-60	Loam, silt loam	CL-ML, CL	A-4, A-6	0	90-100	90-95	75-90	55-75	20-30	5-15
Ts-------------- Treaty	0-17	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-95	25-40	5-15
	17-25	Silty clay loam	CL	A-6	0-5	95-100	90-100	75-95	55-85	30-40	10-15
	25-47	Clay loam, silty clay loam, loam.	CL, CL-ML	A-6, A-4	0-5	95-100	90-100	75-95	55-85	25-40	5-15
	47-60	Loam, silt loam	CL-ML, CL	A-4, A-6	0	90-100	90-95	75-90	55-75	20-30	5-15
Ud*. Udorthents											
Wa-------------- Wallkill	0-5	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0	95-100	90-100	75-100	60-85	16-32	3-12
	5-34	Silt loam, loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	90-100	85-100	75-100	60-85	20-34	6-13
	34-65	Sapric material, marl.	PT, OH	A-8	0	---	---	---	---	---	---
Wo-------------- Westland	0-14	Clay loam--------	CL	A-6	0	100	100	90-100	70-80	30-40	10-20
	14-27	Clay loam--------	CL	A-6	0	90-100	85-100	75-100	60-80	30-40	10-20
	27-38	Very channery loam, channery sandy loam.	SM-SC, GC, SC, GM-GC	A-4, A-6, A-2, A-1	0-5	65-75	50-70	30-60	15-50	<30	5-15
	38-45	Extremely flaggy loam, very flaggy loamy sand.	GM, GM-GC, GC, GP	A-2, A-1	1-5	35-55	30-50	12-50	4-35	<30	NP-15
	45	Weathered bedrock	---	---	---	---	---	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
An----------------- Allison Variant	0-18	40-45	1.35-1.55	0.2-0.6	0.18-0.21	6.6-7.3	Moderate-----	0.28	5	7	4-6
	18-42	35-45	1.35-1.65	0.2-0.6	0.16-0.19	6.6-7.3	Moderate-----	0.28			
	42-60	30-40	1.40-1.65	0.2-0.6	0.14-0.18	6.6-7.8	Moderate-----	0.28			
BlA--------------- Blount	0-12	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.43	3	6	2-3
	12-31	35-50	1.40-1.70	0.06-0.2	0.12-0.19	4.5-8.4	Moderate-----	0.43			
	31-60	27-38	1.60-1.85	0.06-0.2	0.07-0.10	7.4-8.4	Moderate-----	0.43			
Ca---------------- Carlisle	0-60	---	0.13-0.23	0.2-6.0	0.35-0.45	4.5-7.3	-------------	----	---	3	>70
CeB--------------- Celina	0-17	14-26	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	6	1-3
	17-32	35-48	1.45-1.70	0.2-0.6	0.16-0.19	4.5-7.8	Moderate-----	0.37			
	32-60	16-27	1.60-1.82	0.2-0.6	0.06-0.10	7.4-8.4	Low----------	0.37			
CkB--------------- Celina	0-11	14-26	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	6	1-3
	11-29	35-48	1.45-1.70	0.2-0.6	0.16-0.19	4.5-7.8	Moderate-----	0.37			
	29-60	16-27	1.60-1.82	0.2-0.6	0.06-0.10	7.4-8.4	Low----------	0.37			
CnB--------------- Crosby	0-13	15-24	1.40-1.55	0.6-2.0	0.19-0.22	5.1-7.3	Low----------	0.37	3	5	1-3
	13-26	35-40	1.45-1.60	0.06-0.2	0.16-0.17	5.1-7.3	Moderate-----	0.37			
	26-60	15-27	1.70-2.00	0.06-0.2	0.05-0.15	7.4-8.4	Low----------	0.37			
Ee---------------- Eel	0-10	18-27	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
	10-34	18-27	1.30-1.50	0.6-2.0	0.17-0.22	6.1-7.8	Low----------	0.37			
	34-60	10-27	1.30-1.50	0.6-2.0	0.19-0.21	6.1-8.4	Low----------	0.37			
EnA--------------- Eldean Variant	0-8	21-27	1.30-1.45	0.6-2.0	0.20-0.22	5.6-6.0	Low----------	0.28	4	6	3-5
	8-20	35-45	1.45-1.65	0.2-0.6	0.10-0.15	6.1-6.5	Moderate-----	0.28			
	20-25	12-35	1.45-1.70	2.0-6.0	0.06-0.10	6.6-7.8	Low----------	0.10			
	25-60	5-12	1.55-1.75	2.0-20	0.02-0.04	7.4-8.4	Low----------	0.10			
FcA*:											
Fincastle--------	0-12	11-22	1.40-1.55	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	5	1-3
	12-45	23-35	1.45-1.65	0.6-2.0	0.18-0.20	4.5-7.8	Moderate-----	0.37			
	45-60	20-26	1.55-1.90	0.2-0.6	0.05-0.19	7.4-8.4	Low----------	0.37			
Crosby-----------	0-11	11-24	1.35-1.45	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.43	3	5	1-3
	11-22	35-45	1.50-1.70	0.06-0.2	0.15-0.20	5.1-7.8	Moderate-----	0.43			
	22-60	15-27	1.70-2.00	0.06-0.6	0.05-0.17	7.4-8.4	Low----------	0.43			
FoA, FoB---------- Fox	0-11	10-17	1.35-1.55	0.6-2.0	0.17-0.24	5.1-7.3	Low----------	0.37	4	5	1-3
	11-27	18-35	1.55-1.65	0.6-2.0	0.10-0.22	5.1-7.3	Moderate-----	0.43			
	27-35	18-35	1.55-1.65	0.6-2.0	0.10-0.19	5.1-8.4	Moderate-----	0.32			
	35-60	0-2	1.30-1.80	6.0-20	0.02-0.7	7.4-8.4	Low----------	0.10			
FxC3-------------- Fox	0-7	27-35	1.55-1.65	0.6-2.0	0.14-0.23	5.1-7.3	Moderate-----	0.32	3	6	.5-2
	7-20	18-35	1.55-1.65	0.6-2.0	0.10-0.22	5.1-7.3	Moderate-----	0.43			
	20-31	18-35	1.55-1.65	0.6-2.0	0.10-0.19	5.1-8.4	Moderate-----	0.32			
	31-60	0-2	1.30-1.80	>6.0	0.02-0.7	7.4-8.4	Low----------	0.10			
GnB2-------------- Glynwood	0-8	16-27	1.25-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.43	3	6	1-3
	8-26	35-55	1.45-1.75	0.06-0.2	0.11-0.18	4.5-7.8	Moderate-----	0.32			
	26-60	27-36	1.65-1.85	0.06-0.2	0.06-0.10	7.4-8.4	Moderate-----	0.32			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
LnB2, LnE-------- Losantville	0-10	18-27	1.30-1.55	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.37	3	6	1-3
	10-23	35-45	1.40-1.70	0.2-0.6	0.09-0.19	6.1-7.8	Moderate-----	0.37			
	23-60	12-24	1.50-1.80	0.06-0.2	0.05-0.19	7.4-8.4	Low-----------	0.37			
LoC3, LoD3------- Losantville	0-8	27-35	1.30-1.60	0.2-0.6	0.17-0.19	5.6-7.3	Moderate-----	0.37	2	6	.5-2
	8-22	35-45	1.40-1.70	0.2-0.6	0.09-0.19	6.1-7.8	Moderate-----	0.37			
	22-60	12-24	1.50-1.80	0.06-0.2	0.05-0.19	7.4-8.4	Low-----------	0.37			
LsB2------------- Losantville	0-6	18-27	1.30-1.55	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.37	3	6	1-3
	6-18	35-45	1.40-1.70	0.2-0.6	0.09-0.19	6.1-7.8	Moderate-----	0.37			
	18-60	12-24	1.50-1.80	0.06-0.2	0.05-0.19	7.4-8.4	Low-----------	0.37			
LtC3, LtD3------- Losantville	0-4	27-35	1.30-1.60	0.2-0.6	0.17-0.19	5.6-7.3	Moderate-----	0.37	2	6	.5-2
	4-11	35-45	1.40-1.70	0.2-0.6	0.09-0.19	6.1-7.8	Moderate-----	0.37			
	11-60	12-24	1.50-1.80	0.06-0.2	0.05-0.19	7.4-8.4	Low-----------	0.37			
Lw--------------- Linwood	0-18	0	0.15-0.40	0.2-6.0	0.35-0.45	4.5-7.8	-------------	----	2	2	42-65
	18-60	0-35	1.80-1.95	0.6-2.0	0.16-0.20	5.6-8.4	Low-----------	----			
MoA, MoB2-------- Miami	0-10	18-25	1.30-1.45	0.6-2.0	0.22-0.24	6.1-7.3	Low-----------	0.37	5	6	1-3
	10-32	22-35	1.35-1.45	0.6-2.0	0.18-0.21	5.6-7.3	Moderate-----	0.37			
	32-65	18-27	1.40-1.60	0.6-2.0	0.16-0.20	7.4-8.4	Low-----------	0.37			
	65-80	0-27	1.65-1.80	0.6-20	0.01-0.12	7.4-8.4	Low-----------	0.10			
MuB-------------- Morley	0-8	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	Low-----------	0.43	3	6	1-3
	8-11	27-40	1.45-1.65	0.2-0.6	0.18-0.20	5.1-7.3	Moderate-----	0.43			
	11-24	35-50	1.55-1.70	0.2-0.6	0.11-0.15	6.1-7.8	Moderate-----	0.43			
	24-32	27-50	1.60-1.80	0.06-0.6	0.07-0.12	6.1-8.4	Moderate-----	0.43			
	32-60	27-40	1.60-1.80	0.06-0.6	0.07-0.12	6.1-8.4	Moderate-----	0.43			
MyC3------------- Morley	0-8	27-35	1.40-1.60	0.2-0.6	0.18-0.22	5.1-6.5	Moderate-----	0.43	2	7	.5-3
	8-27	35-50	1.55-1.70	0.2-0.6	0.11-0.15	6.1-7.8	Moderate-----	0.43			
	27-60	27-40	1.60-1.70	0.06-0.6	0.07-0.12	6.1-8.4	Moderate-----	0.43			
Pn--------------- Patton	0-11	27-35	1.15-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.28	5	7	3-5
	11-32	27-35	1.25-1.45	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.28			
	32-80	15-35	1.30-1.50	0.2-0.6	0.18-0.22	7.4-9.0	Moderate-----	0.28			
Pw--------------- Pewamo	0-18	27-40	1.35-1.55	0.6-2.0	0.17-0.22	6.1-7.3	Moderate-----	0.28	5	6	3-10
	18-46	35-50	1.40-1.70	0.2-0.6	0.12-0.20	5.6-7.8	Moderate-----	0.28			
	46-65	30-40	1.50-1.75	0.2-0.6	0.14-0.18	7.4-8.4	Moderate-----	0.28			
Px--------------- Pewamo	0-18	18-27	1.35-1.55	0.6-2.0	0.20-0.22	6.1-7.3	Low-----------	0.28	5	5	3-5
	18-50	35-50	1.40-1.70	0.2-0.6	0.12-0.20	5.6-7.8	Moderate-----	0.28			
	50-60	30-40	1.50-1.75	0.2-0.6	0.14-0.18	7.4-8.4	Moderate-----	0.28			
Sa--------------- Saranac	0-8	40-60	1.30-1.50	0.06-0.2	0.12-0.20	6.1-7.8	Moderate-----	0.28	5	4	4-6
	8-40	35-60	1.40-1.70	0.2-0.6	0.10-0.20	6.1-7.8	Moderate-----	0.28			
	40-60	35-60	1.50-1.75	0.2-0.6	0.10-0.20	6.6-8.4	Moderate-----	0.28			
Sm--------------- Sleeth	0-12	11-22	1.30-1.45	0.6-2.0	0.20-0.24	6.6-7.3	Low-----------	0.32	5	5	.5-3
	12-50	20-35	1.45-1.60	0.6-2.0	0.15-0.19	5.6-7.8	Moderate-----	0.32			
	50-65	2-5	1.60-1.80	>20	0.02-0.04	7.9-8.4	Low-----------	0.10			
So--------------- Sloan	0-8	15-27	1.20-1.40	0.6-2.0	0.20-0.24	6.1-7.8	Low-----------	0.37	5	6	3-6
	8-32	22-35	1.25-1.55	0.2-2.0	0.15-0.19	6.1-8.4	Moderate-----	0.37			
	32-80	10-30	1.20-1.50	0.2-2.0	0.13-0.18	6.6-8.4	Low-----------	0.37			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
Tr----------------- Treaty	0-7	18-27	1.50-1.70	0.6-2.0	0.23-0.25	5.6-7.3	Low-----------	0.32	5	6	4-6
	7-32	28-35	1.50-1.70	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.43			
	32-45	20-35	1.50-1.70	0.6-2.0	0.15-0.19	6.6-8.4	Moderate-----	0.43			
	45-60	15-27	1.70-1.90	0.2-0.6	0.17-0.19	7.4-8.4	Low-----------	0.43			
Ts----------------- Treaty	0-17	18-27	1.50-1.70	0.6-2.0	0.23-0.25	5.6-7.3	Low-----------	0.32	5	6	4-6
	17-25	28-35	1.50-1.70	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.43			
	25-47	20-35	1.50-1.70	0.6-2.0	0.15-0.19	6.6-7.8	Moderate-----	0.43			
	47-60	15-27	1.70-1.90	0.2-0.6	0.17-0.19	7.4-8.4	Low-----------	0.43			
Ud*. Udorthents											
Wa----------------- Wallkill	0-5	10-27	1.15-1.40	0.6-2.0	0.16-0.21	5.1-7.8	Low-----------	0.37	5	---	3-8
	5-34	15-35	1.15-1.40	0.6-2.0	0.15-0.20	5.1-7.8	Low-----------	0.32			
	34-65	---	0.25-0.45	2.0-20	0.35-0.45	5.6-7.8	--------------	----			
Wo----------------- Westland	0-14	27-35	1.35-1.50	0.6-2.0	0.18-0.21	5.6-7.3	Moderate-----	0.28	5	6	3-6
	14-27	27-35	1.45-1.60	0.6-2.0	0.12-0.19	5.6-7.3	Moderate-----	0.28			
	27-38	18-27	1.40-1.60	0.6-2.0	0.05-0.13	7.4-8.4	Low-----------	0.20			
	38-45	18-27	1.40-1.60	0.6-2.0	0.05-0.13	7.4-8.4	Low-----------	0.20			
	45	---	---	---	---	---	--------------	----			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "frequent," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
An: Allison Variant	B	Frequent	Brief	Jan-May	>6.0	---	---	>60	---	High	High	Low.
BlA: Blount	C	None	---	---	1.0-3.0	Perched	Jan-May	>60	---	High	High	High.
Ca: Carlisle	A/D	None	---	---	+.5-1.0	Apparent	Sep-Jun	>60	---	High	High	Low.
CeB, CkB: Celina	C	None	---	---	2.0-3.5	Perched	Jan-Apr	>60	---	High	High	Moderate.
CnB: Crosby	C	None	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High	High	Moderate.
Ee: Eel	B	Frequent	Brief	Oct-Jun	1.5-3.0	Apparent	Jan-Apr	>60	---	High	Moderate	Low.
EnA: Eldean Variant	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
FcA*:												
Fincastle	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Moderate.
Crosby	C	None	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High	High	Moderate.
FoA, FoB, FxC3: Fox	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
GnB2: Glynwood	C	None	---	---	2.0-3.5	Perched	Jan-Apr	>60	---	High	High	Moderate.
LnB2, LnE, LoC3, LoD3, LsB2, LtC3, LtD3: Losantville	C	None	---	---	4.0-6.0	Perched	Jan-Apr	>60	---	Moderate	Moderate	Moderate.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Lw----------------- Linwood	A/D	None---------	---	---	+1-1.0	Apparent	Nov-Jun	>60	---	High-----	Moderate	Low.
MoA, MoB2---------- Miami	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
MuB, MyC3---------- Morley	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Pn----------------- Patton	B/D	None---------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Low.
Pw, Px------------- Pewamo	C/D	None---------	---	---	+1-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
Sa----------------- Saranac	C/D	Frequent----	Very long	Nov-Apr	0-1.0	Apparent	Oct-May	>60	---	High-----	High-----	Low.
Sm----------------- Sleeth	C	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
So----------------- Sloan	B/D	Frequent----	Brief-----	Nov-Jun	0-1.0	Apparent	Nov-Jun	>60	---	High-----	High-----	Low.
Tr, Ts------------- Treaty	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
Ud*. Udorthents												
Wa----------------- Wallkill	B/D	None---------	---	---	+.5-1.0	Apparent	Sep-Jun	>60	---	High-----	Moderate	Moderate.
Wo----------------- Westland	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	>40	Hard	High-----	High-----	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Allison Variant	Fine, mixed, mesic Cumulic Hapludolls
Blount	Fine, illitic, mesic Aeric Ochraqualfs
Carlisle	Euic, mesic Typic Medisaprists
*Celina	Fine, mixed, mesic Aquic Hapludalfs
Crosby	Fine, mixed, mesic Aeric Ochraqualfs
Eel	Fine-loamy, mixed, nonacid, mesic Aquic Udifluvents
Eldean Variant	Fine, mixed, mesic Typic Argiudolls
Fincastle	Fine-silty, mixed, mesic Aeric Ochraqualfs
Fox	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
*Glynwood	Fine, illitic, mesic Aquic Hapludalfs
Linwood	Loamy, mixed, euic, mesic Terric Medisaprists
Losantville	Fine, mixed, mesic Typic Hapludalfs
Miami	Fine-loamy, mixed, mesic Typic Hapludalfs
Morley	Fine, illitic, mesic Typic Hapludalfs
Patton	Fine-silty, mixed, mesic Typic Haplaquolls
*Pewamo	Fine, mixed, mesic Typic Argiaquolls
Saranac	Fine, mixed, mesic Fluvaquentic Haplaquolls
Sleeth	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Sloan	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Treaty	Fine-silty, mixed, mesic Typic Argiaquolls
Udorthents	Loamy, mixed, mesic Udorthents
Wallkill	Fine-loamy, mixed, nonacid, mesic Thapto-Histic Fluvaquents
Westland	Fine-loamy, mixed, mesic Typic Argiaquolls

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